4 Comparison of the Alternatives – Environmental Effects

Chapter 4 looks at the beneficial and adverse effects of the project on environmental and community resources. Each section begins with a brief description of the existing condition of a specific resource, then describes how that resource would be permanently affected by the Build Alternative and the No Build Alternative, and concludes with key mitigation measures that would be incorporated into the Build Alternative. Short-term, temporary effects of the alternatives are described in Chapter 5, and a more in-depth discussion of mitigation measures is provided in Chapter 7.

How would the project affect surface water?

See Appendix U, *Water Quality/Surface Water/Floodplains/Groundwater Discipline Report* for more details on surface water, effects of the alternatives, and mitigation.

The study area straddles the East Fork Lewis River subbasin and the Salmon Creek subbasin and passes through the Gee Creek, East Fork Lewis River, and Salmon Creek watersheds (Exhibit 4-1).

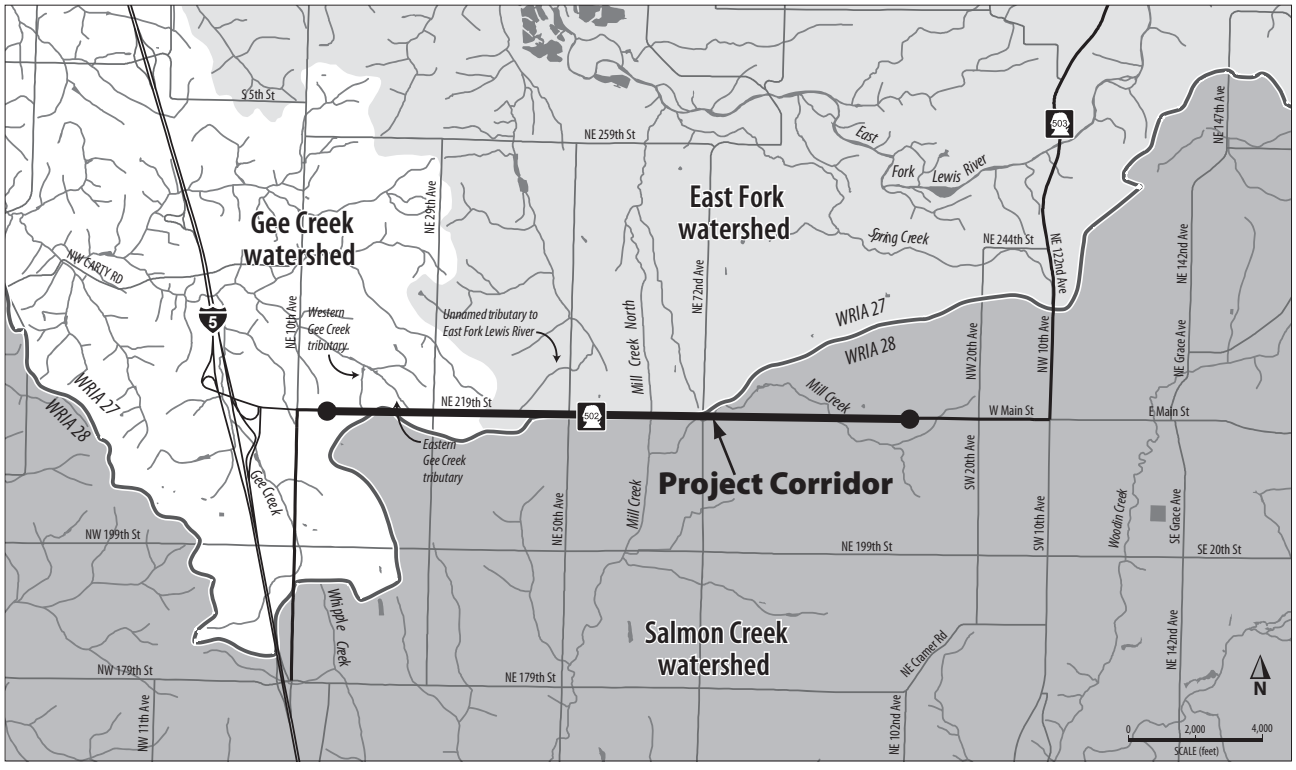


Exhibit 4-1: Watershed boundaries

Gee Creek, East Fork Lewis River, and Salmon Creek are considered tributaries to the Lower Columbia River and are home to a variety of fish species. Surface water bodies in the study area include unnamed tributaries to Gee Creek, Mill Creek North and associated tributaries (part of the East Fork Lewis River watershed), and Mill Creek (part of the Salmon Creek watershed).

DEFINITION

WHAT IS A FEDERALLY-LISTED SPECIES?

A federally-listed species is one which is listed by the federal government as threatened or endangered under the Endangered Species Act.

Mill Creek and Mill Creek North are known to provide suitable habitat for federally-listed species including steelhead and coho salmon, and presumed, although unlikely habitat for chum salmon and Chinook salmon. These water bodies are presumed to provide suitable winter habitat and conditions for young steelhead and coho salmon to find food and shelter to live and grow. They are also presumed to provide areas where sea-run/resident cutthroat trout and steelhead can lay their eggs. The salmonid and steelhead fishery resources are protected under the federal Endangered Species Act.

In 2004, the Clark County Department of Public Works Clean Water Program characterized the water quality of local streams:

- **Gee Creek and some of its tributaries –** "probable poor condition" from sources such as runoff from urban, developed, and agricultural land and highways (I-5), and possible bacterial contamination from agricultural practices.
- **East Fork Lewis River –** "good overall condition", although some of the lower tributaries suffer from bacterial contamination, elevated temperatures, and a reduced diversity of stream life.
- **Mill Creek North –** "probable poor condition".
- **Lower reaches of Mill Creek downstream of NE 199th Street –** "fair condition".
- **Lower reaches of Salmon Creek downstream of the City of Battle Ground –** "poor condition" due to bacteria and turbidity.

DEFINITION

WHAT IS AN IMPERVIOUS SURFACE?

An impervious surface is any surface, such as a rooftop, sidewalk, road, parking lot, and compacted urban soils, that prevents rain from passing through or penetrating and moving into soils as it would naturally.

Untreated stormwater runoff from SR 502 currently enters these receiving water bodies through an existing system of culverts and roadside ditches and through pavement runoff and overland flow. Stormwater runoff from impervious highway surfaces may contain suspended solids, dissolved metals such as zinc and copper, and oil and grease (hydrocarbons) that can degrade surface water quality and affect fish if released into a water body without treatment. Currently, there is no treatment system to prevent pollutants from SR 502 runoff from reaching surface water bodies or wetlands.

DEFINITION

WHAT ARE TOTAL SUSPENDED SOLIDS?

Total suspended solids is the total quantity of dispersed solids, such as fine material or soil particles, carried within a stream.

Under the No Build Alternative, the existing SR 502 corridor would not be retrofitted with stormwater treatment, and stormwater runoff would continue to discharge as it does under existing conditions.

Under the Build Alternative, the existing SR 502 corridor would be widened and stormwater treatment facilities would be added to treat both the new impervious surface as well as a portion of the existing impervious surface. Treatment of a portion of the existing impervious surface is consistent with the practices identified in the Washington State Department of Transportation's *Highway Runoff Manual*. Treatment systems for highway runoff are designed to mitigate potential adverse effects on receiving water bodies by reducing the rate of flow into the receiving water body and capturing pollutants before they are released to receiving water bodies.

KEY POINT

MAINTENANCE OF STORMWATER FACILITIES

Stormwater and water quality facilities would be maintained in accordance with Washington State Department of Transportation's *Highway Runoff Manual*.

The stormwater treatment system for the Build Alternative would consist of "best management practices" (commonly referred to as "BMPs") designed to meet Washington State Department of Transportation's enhanced treatment performance goal of providing a higher rate of removal of dissolved metals than basic treatment facilities. Basic treatment only requires removing 80 percent of the total suspended solids. Enhanced treatment is required in places where the average daily traffic is greater than 30,000 vehicles and listed fish-bearing streams would be the receiving water bodies for the runoff.

DEFINITION

WHAT ARE BEST MANAGEMENT PRACTICES (BMPs)?

Best management practices (BMPs) are physical, structural, and/or managerial practices that, when used singly or in combination, are cost-effective methods of preventing or reducing pollutant discharge.

The primary best management practice method of treatment proposed for SR 502 is the use of a system of constructed wetland/detention ponds, including a wetland/detention pond integrated with wetland enhancement and rehabilitation at the Mill Creek North mitigation site (Exhibit 4-2). Each wetland/detention pond would be designed to capture and provide localized detention of over 90 percent of the runoff generated in each drainage area and would drain into a stream

KEY POINT

Basic water quality treatment is the use of runoff treatment BMPs designed to meet the Washington State Department of Ecology's performance goal of achieving 80 percent removal of total suspended solids from an influent stream. Enhanced treatment is the use of runoff treatment BMPs designed to capture dissolved metals at a higher rate than basic treatment BMPs.

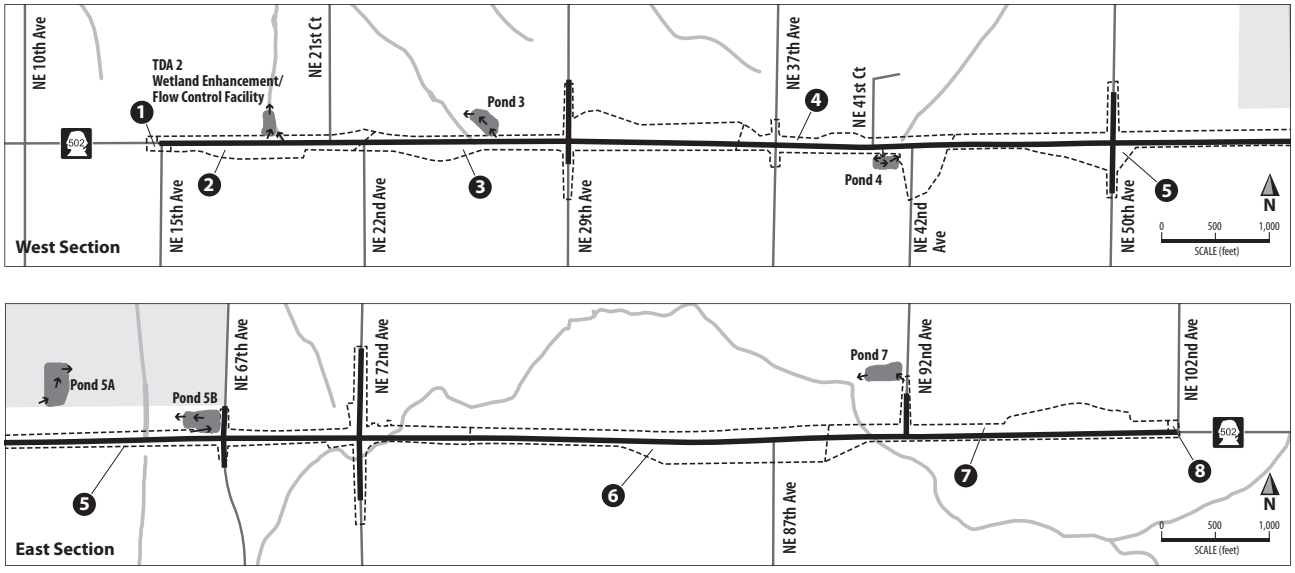


Exhibit 4-2: Stormwater treatment plan for the Build Alternative

DEFINITION

WHAT IS CONCENTRATION?

Concentration is a measure of the strength of a material diluted in water, usually measured in units such as milligrams or micrograms per liter.

KEY POINT

The Build Alternative would provide enhanced water quality treatment of stormwater runoff from all of the new impervious surfaces (28 acres) and about 6 of the 23 acres of currently untreated impervious surfaces. Under the No Build Alternative, all of the stormwater runoff from the existing impervious surfaces in the study area would remain untreated.

DEFINITION

WHAT IS AN EFFLUENT LOAD?

An effluent load is a measure of the quantity of a material discharged into a water body over a given period of time (typically one year), usually measured in units such as pounds or kilograms.

DEFINITION

WHAT IS A BIOLOGICAL ASSESSMENT?

A Biological Assessment is a document that is prepared for compliance with the Endangered Species Act in cases where the potential exists for a project to affect federally listed species. Its purpose is to document the project's potential to affect listed species, to document measures taken to avoid adverse affects, and to make a provisionary effects determination. Scientific data used to prepare Biological Assessments are generally gathered through a combination of field reconnaissance surveys, and scientific literature research; and provisionary effects determinations are established based on an analysis of project design details.

The Biological Assessment is submitted to the National Marine Fisheries Service and/or the US Fish and Wildlife Service because they have jurisdiction over federally-listed species (see Key Point on page 4-5 for further details).

within that threshold discharge area. The water quality system is designed for storm events of approximately 1.3 inches in a 24-hour period. The wetlands/detention ponds would treat the captured stormwater by removing suspended solids and metals through the biological action of plants and bacteria. This method of treatment would complement existing wetlands in the project vicinity.

The system would provide enhanced treatment for runoff from approximately 28 acres of new impervious surfaces and about six acres of existing impervious surfaces. This is a total of 34 acres of impervious surfaces being treated out of a total of about 51 acres in the study area. These quantities may be refined as design progresses, but the overall approach would not change.

With the improved stormwater treatment associated with the project, the effect of the Build Alternative on surface water would be:

- Moderate decrease in total suspended solids being discharged
- Significant decrease in the concentration of total and dissolved metals being discharged
- Increase in the quantity (i.e. effluent load) of total and dissolved metals being discharged compared to the No Build Alternative.

The increase in the effluent load of metals would likely have minor effects to fish habitat quality within Mill Creek and Mill Creek North. However, metal concentrations would dilute to existing concentration levels within a few feet (or less) of entering the water bodies. Thus, the extent of water having a higher concentration of dissolved metals than what is already present would be confined to small areas. These increases in effluent loads would also be offset by habitat improvements, culvert replacements, riparian vegetation restoration and other compensatory mitigation measures as described in the biological section.

How would the project affect biological resources?

See Appendix I, *Biology Discipline Report* for more details on biological resources, effects of the alternatives, and mitigation.

Construction of the Build Alternative has the potential to affect biological resources such as plant communities and the fish and wildlife species that depend on them for food and shelter.

Project biologists prepared a Biological Assessment to examine the potential for the SR 502 Corridor Widening Project to affect species protected by the Endangered Species Act. The Biological Assessment examined biological resources within an area much larger than the project corridor. Within this larger area, the Biological Assessment

identified potential effects to eight plant and fish and wildlife species that have either been documented or have potential habitat.

The Biological Assessment concluded that the project would have "no effect" on bull trout; the project "may affect, but is not likely to adversely affect" golden paintbrush, water howellia, Bradshaw's lomatium, and chum salmon; and the project would be "likely to adversely affect" steelhead, coho salmon, and Chinook salmon. The Biological Assessment also addressed the potential for effects to designated critical habitat for steelhead, Chinook salmon, chum salmon, and bull trout. Findings showed that the project would have "no effect" on designated critical habitat for Chinook salmon, chum salmon, and bull trout, but that the project would be "likely to adversely affect" designated critical habitat for steelhead.

DEFINITION

WHAT IS DESIGNATED CRITICAL HABITAT?

Critical habitats are areas designated under the Endangered Species Act as having physical and biological features essential to the conservation of specific endangered or threatened species.

Within the project study area no federal or state threatened or endangered plant species have been documented. Vegetation resources consist of plant species found in upland grassland, scrub-shrub (trees and shrubs less than 20 feet in height), and forest habitat types, as well as wetland plants found in wetland and riparian habitats. Prairies or native grasslands may once have been present in the study area, but few native prairie plants are observed now. The few prairie plants observed within the study area are all found in areas that have been farmed or used for grazing and are regularly disturbed by ongoing agricultural activities. The project would affect approximately 3–5 acres of this disturbed habitat in which prairie plants were observed. Under the Build Alternative, the Mill Creek North mitigation site would preserve a large mature stand of Oregon White Oak and would enhance this area as an oak woodland/grassland mosaic that would include native prairie plants.

DEFINITION

WHAT ARE FEDERAL OR STATE THREATENED AND ENDANGERED SPECIES?

Both the federal government and Washington State maintain threatened and endangered species lists, which identify plant, wildlife, and fish species that face significant threats to their continued survival. Threatened species are those that are in danger of being listed as endangered. Endangered species are those that are in danger of becoming extinct. Appendix I, *Biology Discipline Report*, identifies listed species that can be found in southwestern Washington in habitats similar to those in the project study area.

Wildlife resources in the study area are closely associated with the habitat types described above. Wildlife typical of grassland, scrub-shrub, and forest communities in the study area may include birds, small mammals, and amphibians. Fish and wildlife habitat along the corridor have also been disturbed by historical and ongoing farming and grazing activities.

There are no documented occurrences of federal or state threatened or endangered wildlife species in the project study area (excluding fish species). Migrating waterfowl have been observed wintering in the study area's central portion and are associated with Mill Creek North and Mill Creek. This area is designated by the Washington State Department of Fish and Wildlife as supporting wintering waterfowl concentrations.

KEY POINT

The Biological Assessment was drafted and submitted along with a request for formal Endangered Species Act consultation with the National Marine Fisheries Service and informal consultation with the US Fish and Wildlife Service. A letter of concurrence with the findings of the Biological Assessment was received from the US Fish and Wildlife Service on November 24, 2008 and is included in Appendix D, *Agency Correspondence*. The National Marine Fisheries Service issued a Biological Opinion after completion of the formal consultation process, also included in Appendix D, *Agency Correspondence*.

Eastern Gee Creek tributary flowing through a field.

Within the project's study area, the Gee Creek tributaries, the unnamed tributary to the East Fork Lewis River, Mill Creek North, Mill Creek, the Mill Creek tributary, and Curtin Creek support, or have the potential to support, fish populations. Federally listed fish species that have the potential to occur within the project's study area include steelhead, coho salmon, Chinook salmon, and chum salmon. Additionally, the portion of Mill Creek North that is north of SR 502 has been designated critical habitat for steelhead. With the exception of Curtin Creek, these small streams drain mostly agricultural areas in Clark County (Exhibit 4-3).

Under the No Build Alternative, there would be no new direct effects to biological resources because there would be no changes to the existing roadway facility.

Since no listed species have been documented or observed in the project's study area, the Build Alternative would not have a direct effect to listed plants or wildlife. The Build Alternative would, however, permanently convert existing vegetated areas to roadway and related facilities (Exhibit 4-3). Between 29–34 acres of upland grassland, 5–6 acres of upland scrub-shrub, and 10–15 acres of upland forest would be converted to roadway and related facilities under the Build Alternative. Approximately 4–6 acres of upland and wetland riparian environment would also be converted. The affected areas are immediately adjacent to SR 502 and are already highly fragmented and disturbed.

DEFINITION

WHAT IS HABITAT FRAGMENTATION?

Habitat fragmentation is the separation of a continuous wildlife habitat into separate fragments or patches. Fragmentation typically occurs when land is converted from one type of use to another. In general, larger patches support a greater diversity of species than smaller patches; therefore fragmentation of habitats can reduce species diversity in areas that are not already fragmented or disturbed.

Permanent vegetation removal resulting from the Build Alternative would lead to additional fragmentation and loss of disturbed wildlife habitat. The Build Alternative would disturb land associated with wintering waterfowl concentrations near Mill Creek North and Mill Creek. However, the Mill Creek North mitigation site, which is 68 acres in size, would be designed to enhance in-stream habitat and floodplain connectivity and would maintain the seasonally ponded conditions of this area. This site is contiguous with and includes existing wintering waterfowl habitat on Mill Creek North, and would represent a net increase in the quantity and quality of suitable wintering waterfowl habitat associated with Mill Creek North. Therefore, wintering waterfowl concentrations are not anticipated to be negatively affected by the Build Alternative.

Although the SR 502 corridor has a very low rate of vehicle collisions with large wildlife (such as deer and elk) and is not located in an area that is managed as priority wildlife habitat, Washington State Department of Transportation is investigating ways to enhance wildlife connectivity within the project corridor in accordance with the Washington State Department of Transportation Secretary's Executive

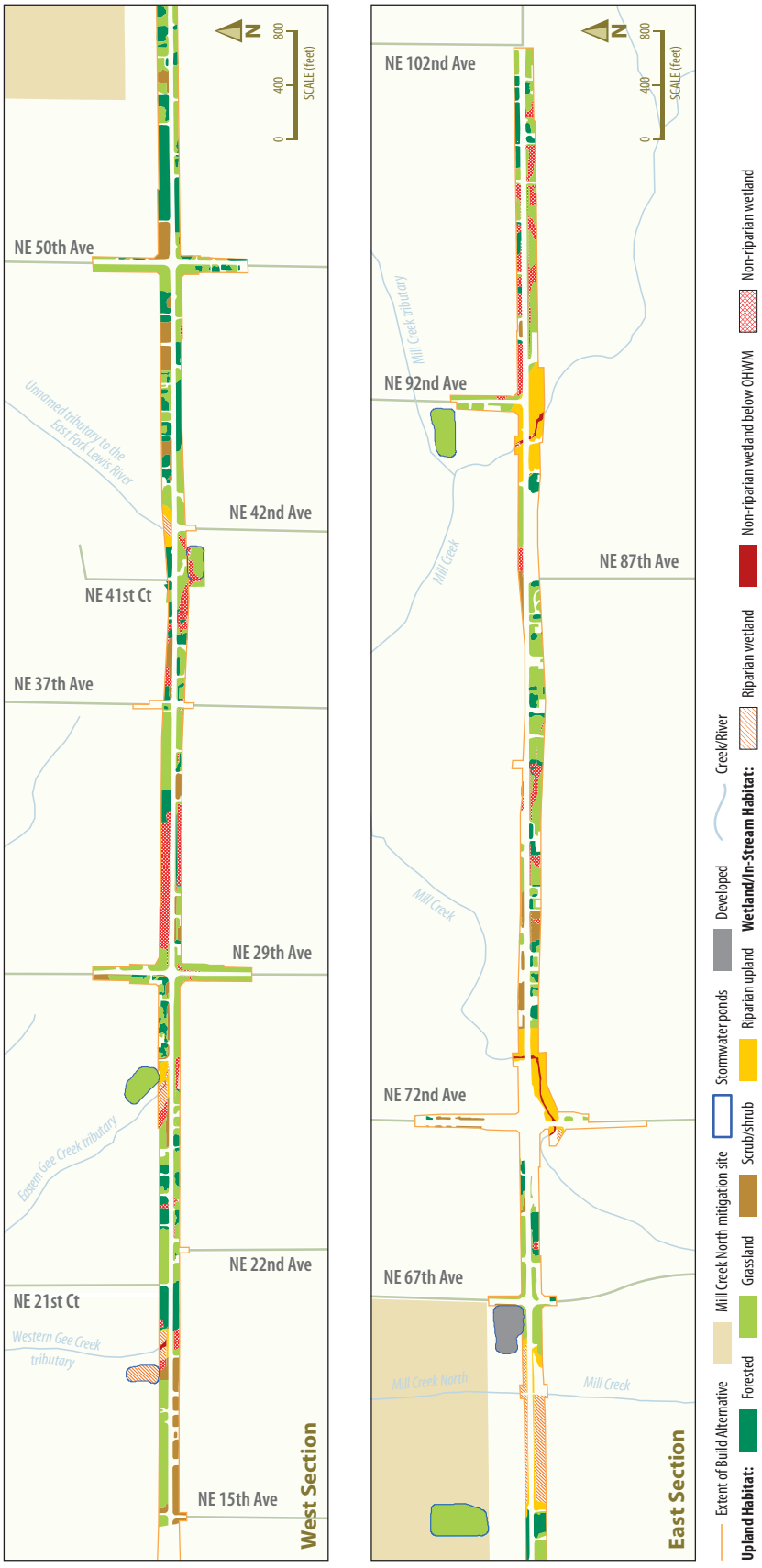


Exhibit 4-3: Vegetation resources and direct effects

KEY POINT

CULVERT REPLACEMENT

The Build Alternative would replace four culverts with stream simulation culverts that facilitate wildlife connectivity and fish passage.

DEFINITION

WHAT IS THE ORDINARY HIGH WATER MARK?

The ordinary high water mark is the physical mark along waterways that indicates the water height normally reached during average high flows.

Order E 1031.00: Protections and Connections for High Quality Natural Habitats. Under the Build Alternative fish and wildlife would benefit from the replacement of four existing culverts with large "stream simulation" culverts which facilitate natural stream processes as well as fish passage and wildlife connectivity. These culverts are much wider than typical culverts, and the bottoms of the culverts are filled with rocks and other natural streambed material. The replacement culverts would allow wildlife ranging from amphibians to birds to rodents to pass under SR 502. Fish would be able to migrate through the stream simulation culverts, and some species have been known to use these types of culverts as spawning areas.

Direct effects to in-stream fish habitats occur when there are disturbances in areas located below the ordinary high water mark of water bodies that support, or could potentially support, resident or migratory fish populations. The project would disturb between 2–3 acres of land below the ordinary high water mark; most of this habitat is accessible to resident and migratory fish species. Water body disturbances would primarily result from placement of fill material for roadway slopes, and culvert replacement/extension. Direct effects to fish and fish habitat also include increased impervious surface, increased quantities of total and dissolved metals in stormwater, potential sedimentation from clearing and grubbing, and potential for fish handling from in-water work, which could result in mortality of fish. Fish would benefit from the installation of stream simulation culverts that would facilitate migration in creeks crossing SR 502.

The majority of disturbance to fish habitat (2–3 acres) would occur on Mill Creek North and Mill Creek, which has the potential to affect both listed and non-listed species. Most of this acreage is located adjacent to Mill Creek North and is potential rearing and wintering habitat for steelhead and coho salmon. Though the portion of Mill Creek North that is north of SR 502 has been designated critical habitat for steelhead, the Build Alternative would result in less than 0.1 acre of direct loss of designated critical habitat in the stream proper.

To help offset these effects, the Build Alternative includes revegetation of areas temporarily disturbed by construction activities. These areas will be replanted with native vegetation to replace or enhance functions temporarily impaired by construction. Temporarily disturbed riparian areas and riparian areas targeted for restoration will be seeded and planted with a preference for woody vegetation to provide in-stream shading and bank stability.

At the Sunset Oaks wetland mitigation site, Curtin Creek would be restored to a more natural functioning stream. At the Mill Creek North

mitigation site, mitigation and restoration activities would improve a portion of the in-stream habitat on Mill Creek North, which would greatly improve the habitat for steelhead, and more than replace any function lost by the placement of fill during construction. When possible, trees removed from riparian areas will be salvaged and used for woody debris placement to enhance habitat at these and other environmental mitigation sites. Two buildings adjacent to Mill Creek would be demolished and the land (over 0.2 acres) would be planted with riparian plant species and restored to riparian habitat.

KEY POINT

Beneficial effects of the Build Alternative on area fish resources include the restoration of approximately 3,000–5,000 linear feet of in-stream habitat near the headwaters of Curtin Creek, and a portion of in-stream habitat as part of the Mill Creek North mitigation site.

How would the project affect wetlands?

See Appendix V, *Wetland Delineation Report* for more details on wetlands, effects of the alternatives, and mitigation.

Wetlands are unique natural features that are important to the health of the ecosystem. They can improve water quality, store floodwaters, contribute to groundwater recharging and stream flows, and provide habitat for wildlife and plants.

To identify wetlands in the study area, extensive field surveys and wetland delineations were conducted using scientific methods outlined in the *Washington State Wetland Identification and Delineation Manual* (Washington State Department of Ecology, 1997). A total of 74 wetlands have been identified in the study area (Exhibit 4-4). These are categorized according to the US Fish and Wildlife Service system and rated using the *Washington State Wetland Rating System for Western Washington – Revised* (Hruby, 2004) to describe the quality and level of function of each wetland. This is a rating system that considers factors such as sensitivity to disturbance, significance, rarity, the ability to be replaced, and the level of function provided. Specific wetland functions considered include flood storage, erosion control, water quality improvement, and fish and wildlife habitat. Wetlands in all four of the following categories are present in the study area:

DEFINITION

WHAT ARE WETLANDS AND HOW ARE THEY IDENTIFIED?

Wetlands are areas that are saturated with groundwater near the surface or areas that are flooded for extended periods of time and that support vegetation that can live in saturated soils. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands delineation is the process of identifying the boundaries of a wetland by observing evidence of three factors that indicate the presence of a wetland: hydric (wetland) soils; vegetation that can live in saturated soils; and sufficient water to support wetland soils and vegetation.

- **Category I wetlands** are: 1) unique or rare; or 2) more sensitive to disturbance than most wetlands; or 3) relatively undisturbed, with ecological attributes that are impossible to replace within a human lifetime; or 4) provide a high level of wetland functions.
- **Category II wetlands** are difficult, though not impossible, to replace, and provide a high level of wetland functions.
- **Category III wetlands** have generally been disturbed in some ways and are often smaller, less diverse, and/or more isolated from other natural resources in the landscape, and provide a moderate level of wetland functions.

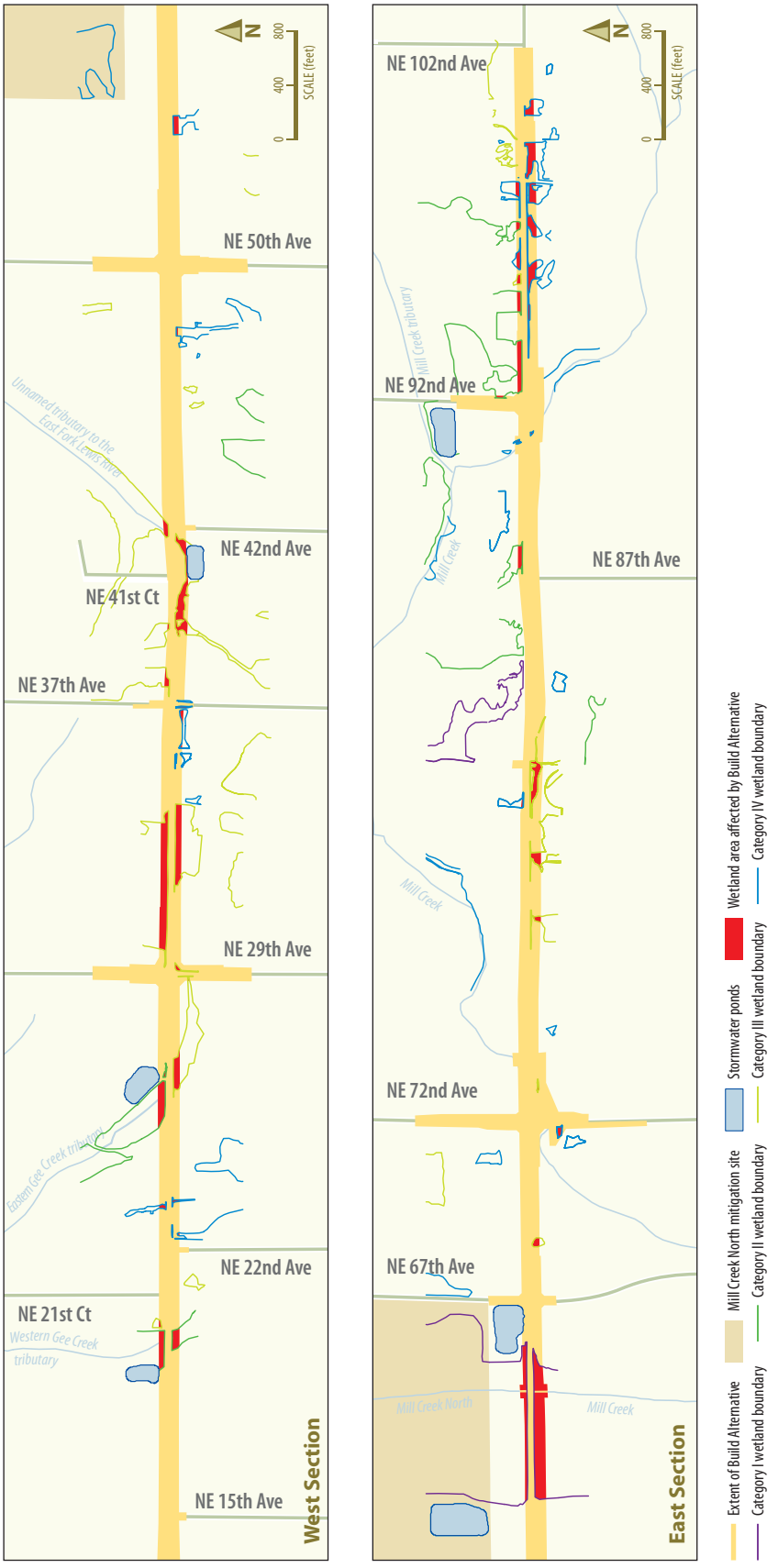


Exhibit 4-4: Wetlands in the study area

- **Category IV wetlands** are often heavily disturbed and provide the lowest level of wetland functions. These are wetlands that can be replaced, and in some cases, improved.

Wetlands in the study area range from very low functioning to high functioning, with the higher functioning wetlands found mostly to the north of SR 502. The north side contains 2 Category I wetlands, 9 Category II wetlands, 13 Category III wetlands, and 9 Category IV wetlands, while the south side contains 1 Category I wetland, 2 Category II wetlands, 15 Category III wetlands, and 23 Category IV wetlands.

The Build Alternative has been designed to avoid wetland effects to the extent practicable (see sidebar). The Build Alternative would affect 41 of the 74 wetlands in the study area. Based on the preliminary design, the project would fill 9 to 14 acres of wetlands (Exhibit 4-5). The total quantity of wetland fill may change slightly as the design is revised and finalized. Approximately half of the wetland effects would be minor because they would fill only relatively small (relative to the overall size of the wetland) and already disturbed potions of larger wetlands and wetland complexes. These wetlands generally provide high levels of water quality and water storage functions, and relatively low levels of habitat function. However, the affected portions of these wetlands are primarily adjacent to the SR 502 roadway and provide lower levels of all of these functions.

Exhibit 4-5: Wetland area of permanent effects

BUILD ALTERNATIVE	
Wetland category	**Area of permanent effects**
Category I	3–5 acres of fill
Category II	3–4 acres of fill
Category III	2–3 acres of fill
Category IV	1–2 acres of fill
Total	**9–14 acres of fill**

A comprehensive, watershed-based mitigation strategy for the project would create new wetlands, and restore and enhance degraded wetlands to a higher degree of function. This mitigation will meet federal, state, and local requirements, and will result in the surface area of new wetlands created totaling approximately 27–42 acres, three times the surface area of wetlands filled (see sidebar). Mitigation sites would be selected to provide the greatest ecological benefit to the watersheds affected. Two sites have been identified to date: the Sunset Oaks wetland mitigation site and the Mill Creek North mitigation site (Exhibit 4-6). Other wetland mitigation sites may follow as the design progresses.

KEY POINT

The Washington State Department of Transportation incorporated several design techniques into the Build Alternative that would avoid or minimize effects to wetlands. These techniques include:

- Reducing the acres of wetlands filled by steepening slopes on the sides of the widened highway
- Raising the grade of the highway through the Mill Creek North area in order to capture and treat stormwater that would otherwise flow directly into the wetland
- Reduce shoulder widths in intersection areas in order to reduce the overall footprint of the roadway
- Use of the media filter drain best management practice to treat stormwater runoff before it leaves the roadway prism
- Locate stormwater detention ponds outside of wetland buffers wherever possible.

KEY POINT

The Clark County Critical Areas Ordinance and joint guidance prepared by the Washington State Department of Ecology and the US Army Corps of Engineers specify how many acres of new wetlands must be created if existing wetlands are filled as part of the project. The ratio of new wetlands created to existing wetlands filled is based on the type of wetland affected. For this project, every one acre of wetland filled would require approximately three acres of new wetlands be created. Twenty-four to 36 acres surface area of new wetlands would be created as mitigation for eight to twelve acres of wetland fill. In other words, the surface area of new wetlands created would total approximately three times the surface area of wetlands filled.

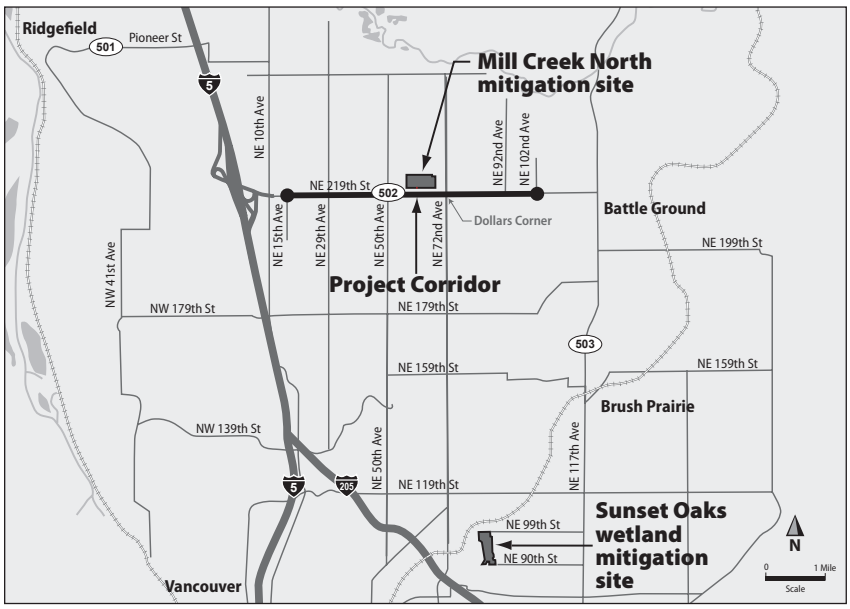


Exhibit 4-6: Location of wetland mitigation sites

How would the project affect floodplains?

See Appendix U, *Water Quality/Surface Water/Floodplains/Groundwater Discipline Report* for more details on floodplains, effects of the alternatives, and mitigation.

DEFINITION

WHAT IS A FLOODWAY AND A 100-YEAR FLOODPLAIN?

A floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved in order to discharge the base (100-year) flood without cumulatively increasing the water surface elevation more than a designated height. For Clark County, the designated height is one foot (FEMA, NFIP Policy Index). The 100-year floodplain is an area with a one percent chance of being flooded in any given year.

The majority of the study area is mapped by the Federal Emergency Management Agency as having minimal flooding. However, the study area also contains a floodway and 100-year floodplain for Mill Creek (Exhibit 4-7).

Mill Creek crosses SR 502 at two locations and Mill Creek North crosses SR 502 at one location through existing culverts. Mill Creek also crosses NE 72nd Avenue just south of SR 502. The Mill Creek crossing of SR 502 approximately 500 feet east of NE 72nd Avenue is the only crossing containing a mapped floodway.

Under the No Build Alternative, no changes in the floodplain or the flood storage capacity of the Mill Creek floodway would occur, and no existing culverts would be replaced.

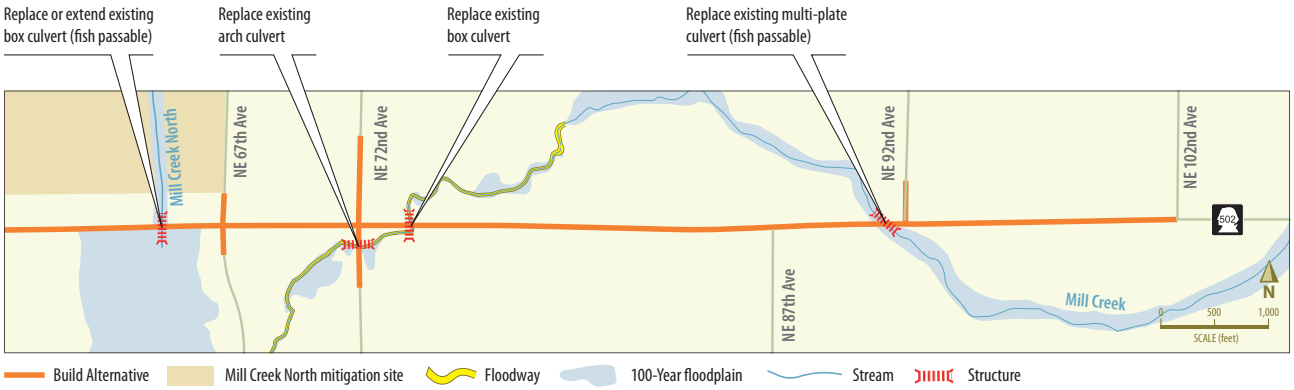


Exhibit 4-7: Floodplain locations and culvert modifications with the Build Alternative

Under the Build Alternative, fill would be placed within the 100-year floodplain of Mill Creek, however no fill would be placed in the floodway or in the creek's channel. The floodplain areas that would be filled are currently used primarily as open pastures, agricultural land and rural residential development, with some areas of urban residential and commercial development in the eastern portion of the project corridor located within Battle Ground. None of the fills proposed are very large in size due to the relative flatness of the study area.

While the proposed floodplain fill would result in the minor loss of some flood storage, the Build Alternative would create flood storage capacity in other places to make up for this loss. The Build Alternative includes the replacement of the three existing Mill Creek culverts under SR 502 and the extension or replacement of the Mill Creek North culvert. The culvert replacement at Mill Creek North would likely benefit the floodplain functions by increasing the flood storage capacity at this location.

KEY POINT

The Build Alternative would result in no net loss of flood storage capacity.

Clark County's regulations require no net loss of existing storage capacity for a 100-year flood event. The Build Alternative would comply with Clark County's regulations through the floodplain permit process.

How would the project affect groundwater?

See Appendix U, *Water Quality/Surface Water/Floodplains/Groundwater Discipline Report* for more details on groundwater, effects of the alternatives, and mitigation.

The SR 502 study area is within an area of Clark County that overlies both shallow aquifer formations and the deeper Troutdale Aquifer System, which is a sole-source aquifer. The sole-source aquifer designation requires special consideration of the effects to groundwater quality and potential contamination. A layer of silt and clay separates the shallow and deep aquifers in the study area. Given local rain patterns and soil types, very little water infiltrates into the aquifers; most rainwater ends up as runoff or groundwater that enters into streams. The recharge areas for the Troutdale Aquifer are located east of the study area in the foothills of the Cascade Mountains.

DEFINITION

WHAT IS A SOLE-SOURCE AQUIFER?

A sole-source aquifer is an aquifer or aquifer system that supplies 50 percent or more of the drinking water for a given service area and for which there are no reasonably available alternative sources should the aquifer become contaminated. The US Environmental Protection Agency designates sole-source aquifers under the Safe Drinking Water Act.

Within the project study area, large volumes of groundwater are withdrawn from both the shallow aquifer and the Troutdale Aquifer System. Private drinking water wells draw water from shallow depths of 41–88 feet below ground level, while a City of Battle Ground public water supply well at the eastern edge of the study area draws water from the Troutdale Aquifer System at depths of 272–379 feet below ground level.

DEFINITION

WHAT IS AN AQUIFER RECHARGE AREA?

An aquifer recharge area is an area where rainfall, snowmelt, infiltration from lakes, wetlands and streams, or irrigation water infiltrates into the ground and adds to the water underground that can supply a well.

To protect the quality of groundwater, Clark County regulates the area around drinking wells where groundwater could enter the aquifers. In these areas, Clark County requires a Critical Aquifer Recharge Areas permit for some activities. Clark County GIS identifies two groundwater protection areas within the study area: one along SR 502 between NE 50th and NE 72nd Avenues, and a larger one centered on SR 502 at the Mill Creek crossing near NE 92nd Avenue (Exhibit 4-8).

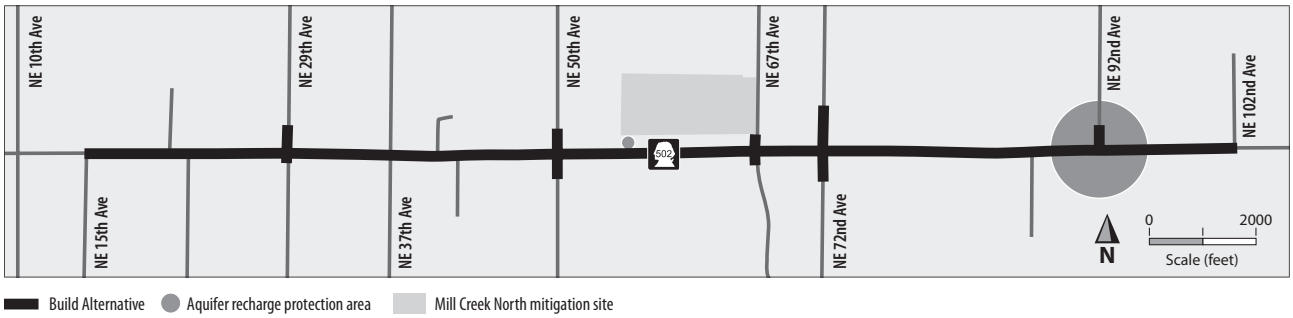


Exhibit 4-8: Aquifer recharge protection areas

With the No Build Alternative, stormwater from SR 502 would remain untreated, and no changes to the quality of groundwater are expected to occur.

Similarly, no adverse effects to groundwater quality are expected to occur under the Build Alternative. This alternative would not affect the quality of groundwater within the sole-source Troutdale Aquifer System due to the silt and clay layer between the shallow and deep aquifers and because recharge occurs east of the study area in the foothills of the Cascade Mountains. The Build Alternative is not expected to affect the quality of groundwater in the shallow aquifer because most of the stormwater runoff from the project would be treated and discharged to areas that flow into surface waters. The Build Alternative would also not reduce recharge to the shallow aquifer as very little infiltration currently occurs. The project would be exempt from Clark County's Critical Aquifer Recharge Areas regulations and permit requirements because stormwater treatment of highway runoff is not a regulated activity.

How would the project affect geology and soils?

See Appendix R, *Soils and Geology Discipline Report* for more details on geology, effects of the alternatives, and mitigation.

The study area lies within the Portland basin, a geologic depression that was formed by volcanic and marine sedimentary rocks. Overlying these rocks are moderately consolidated sandy gravels that were deposited from the ancient Columbia River. Other soils have been deposited as a result of enormous floods which took place as recently as 13,000 years ago. These floods resulted from massive ice dam failures in western

Montana, which sent water and debris coursing down the Columbia River, depositing sandy soils in the study area. Generally, the study area is flat and does not present any slope stability hazards.

There are several soil types that intersect the SR 502 alignment (see sidebar). Of particular concern from a roadway design perspective are organic and peat-laden soils because these soils tend to have poor bearing capacity and result in the road settling. A band of organic soils approximately 1000-feet wide has been identified crossing the SR 502 alignment west of NE 67th Avenue, and organic soils could be present elsewhere as well. These soils may necessitate a wider right of way in the area between NE 50th Avenue and NE 67th Avenue to accommodate a roadway design that addresses the unique issues of peat soils. Organic soils are also common in the Mill Creek North mitigation site and the Sunset Oaks wetland mitigation site (see sidebar).

Under the No Build Alternative, the existing SR 502 facility would remain as is, and no soils would be disturbed.

Under the Build Alternative, roadway widening would disturb soils adjacent to the corridor, as well as those at the Mill Creek North wetland mitigation site. To prevent excessive settlement, the design and construction of the roadway would have to account for peat-laden soils that may have poor bearing capacity. The Build Alternative would apply techniques from Washington State Department of Transportation's *Geotechnical Design Manual*, which specifies proper techniques for constructing roadways on these soil types.

KEY POINT

SOIL TYPES WITHIN STUDY AREA (INCLUDING MILL CREEK NORTH MITIGATION SITE)

- Gee silt loam*[1]
- Odne silt loam*
- Hesson clay loam*[1]
- Washougal gravely loam*[1]
- Tisch silt loam*[2]
- Lauren loam*[1]
- Dollar loam*[1]
- Hockinson loam, moderately well drained*[2]
- Olequa silty clay loam
- Cove silty clay loam

SOIL TYPES WITHIN THE SUNSET OAKS WETLAND MITIGATION SITE

- Cove silty clay loam
- Cove silty clay loam, thin solum
- Hillsboro silt loam, 0% to 3% slopes[1]
- Hillsboro silt loam, 3% to 8% slopes[1]
- McBee silt loam[2]
- Semiahmoo muck[2]
- Sifton gravelly loam[3]

* Soil types intersect SR 502 alignment
[1] Prime farmland
[2] Prime farmland if drained
[3] Prime farmland if irrigated

DEFINITION

WHAT ARE PEAT-LADEN SOILS?

Soils formed of decomposing plant material in a water saturated environment. These soils are susceptible to excessive settlement if not properly accounted for during project design and construction.

How would the project affect farmlands?

See Appendix O, *Land Use/Agricultural and Farmland/Public Lands/Relocations and Right of Way Acquisitions Discipline Report* for more details on farmlands, effects of the alternatives, and mitigation.

Approximately half of the 432 acres in the study area are currently or have recently been used for farming, including the 68 acre Mill Creek North mitigation site. Many of these agricultural properties also include a rural residence or a commercial business (Exhibit 4-9). In addition to farming, development of rural residences on 5, 10, and 20 acre lots is allowed, and, over time, farmlands have been subdivided into large lots for the development of rural residences. Farming is a permitted activity in all Clark County land use zones within the study area. Maps showing the existing land uses, zoning, and soil types are included in Appendix O, *Land Use/Agricultural and Farmland/Public Lands/Relocations and Right of Way Acquisitions Discipline Report*.

Exhibit 4-9: Existing agricultural land uses within the study area

Existing agricultural land uses	Acres	Percentage of Study Area
Agriculture	36	8%
Agriculture and Commercial	8	2%
Single Family Residential and Agricultural	166	38%
TOTAL	**210**	**48%**

DEFINITION

WHAT IS PRIME FARMLAND?

Prime farmland is highly productive cropland as designated by the US Department of Agriculture's Natural Resources Conservation Service.

Some of the soils found in the study area are soil types designated as prime farmland by the US Department of Agriculture Natural Resources Conservation Service (see sidebar on previous pages). There are approximately 376 acres of prime farmland soils in the study area, including 63 acres at the 68 acre Mill Creek North mitigation site. Of these 376 acres, approximately 54 percent are currently used or have recently been used for agricultural activities (Exhibit 4-10). The 32-acre Sunset Oaks wetland mitigation site, which is currently vacant and not in use for agricultural purposes, also consists of approximately 22 acres of soils that are considered prime farmland.

Exhibit 4-10: Prime farmland within the study area

Prime farmland soil types*	Amount present in study area	Amount currently or recently used for agriculture
Gee silt loam (GeB)	51 acres	28 acres
Hesson clay loam (HcB)	40 acres	23 acres
Washougal gravelly loam (WgB)	37 acres	25 acres
Tisch silt loam (ThA)	54 acres	52 acres
Lauren loam (LeB)	6 acres	0 acres
Dollar loam (DoB)	153 acres	58 acres
Hockinson loam (HuB)	35 acres	16 acres
Total	**376 acres**	**202 acres**

*** Note:** Only soil types designated as "prime farmland" are listed in this table.

KEY POINT

Approximately 83 percent of the land that would be acquired for the Build Alternative is currently used for agriculture. Approximately 72 percent of this land is the Mill Creek North mitigation site. Agricultural land acquired for the project would either be converted to right of way and stormwater facilities or restored to historic wetland and stream functions at the Mill Creek North mitigation site.

Approximately 65 percent of the land that would be acquired for the Build Alternative is designated as prime farmland. Approximately 82 percent of this land would be the Mill Creek North mitigation site.

Under the No Build Alternative, the existing SR 502 facility would remain as it currently exists. No land currently used for farming would be disturbed, and no prime farmland would be converted to non-agricultural uses.

Under the Build Alternative, roadway widening would require that approximately 17–37 acres of land currently used for farming be converted to right of way based on current design; this conversion represents 60 percent of the total acreage that would be acquired for right of way. It should be noted that for many properties, the land that would be acquired is a portion of the parcel near the highway that is not actively farmed. In addition, the 68 acre Mill Creek North mitigation site would be converted from its current agricultural use to a wetland mitigation area. Washington State Department of Transportation only

acquires mitigation land from property owners willing to sell, unless it has no alternative. Washington State Department of Transportation will make every effort to avoid condemning agricultural lands for mitigation purposes.

The Build Alternative would also disturb prime farmland soils adjacent to the project corridor, as well as those at mitigation sites, and convert them to non-agricultural uses. It is anticipated that 12–16 acres of land adjacent to the SR 502 corridor, with soils classified as prime farmland would be acquired and converted to a transportation use to accommodate roadway widening. An additional 63 acres of prime farmland soils would be converted to a public use (not farmable) at the Mill Creek North mitigation site to restore the site's historic natural wetland and stream functions. Similarly, the 22 acres of prime farmland soils at the Sunset Oaks wetland mitigation site would be converted to a public use.

The Natural Resource Conservation Service determined that approximately 101 acres of prime farmland would be converted as part of the project and completed a farmland conversion impact rating for the Build Alternative, which is included in Appendix D, *Agency Correspondence*.

How would the project affect land uses?

See Appendix O, *Land Use/Agricultural and Farmland/Public Lands/Relocations and Right of Way Acquisitions Discipline Report* for more details on land uses, effects of the alternatives, and mitigation.

Current land uses in the project corridor reflect the semi-rural area of unincorporated Clark County that SR 502 passes through, with a cluster of rural commercial businesses at Dollars Corner. The predominant land uses are agriculture, low density residential, and rural commercial (Exhibit 4-11). The Sunset Oaks wetland mitigation site is currently vacant and is adjacent to an area of low-density residential homes. The Mill Creek North mitigation site is currently used for agriculture with an unoccupied single family residence.

Land in the study area is primarily zoned for rural uses including agriculture, rural residential and rural commercial uses (Exhibit 4-12). Land in the study area that is within the City of Battle Ground's urban growth area is currently zoned Mixed Use (MX) by Clark County. When this land is annexed into the City it will be rezoned as Mixed Use – Employment (MU-E). The Mill Creek North mitigation site is located within Clark County's Rural 20 zone (R-20). The Sunset Oaks wetland mitigation site is located in the County's Single Family Residential (R1-6) zone, and is located within the urban growth area for the City of Vancouver.

Exhibit 4-11: Existing land uses in the study area

Existing land use	Acres	Percentage of study area	Percentage of acres acquired for right of way under the Build Alternative*	Percentage of acres acquired for wetland mitigation under the Build Alternative**
Agriculture	36	8%	15%	0%
Agriculture and Commercial	8	2%	3%	0%
Church	4	1%	3%	0%
Commercial	42	10%	9%	0%
Commercial and Single Family Residential	32	8%	10%	0%
Public	4	1%	0%	0%
Single Family Residential	56	13%	15%	0%
Single Family Residential and Agriculture	166	38%	40%	100%
Vacant	26	6%	5%	0%
Existing Right of Way	58	13%	0%	0%
Total	**432**	**100%**	**100%**	**100%**
			40–60 acres	**68 acres**

***Note:** Acquisition estimates are based on current design and will be refined as the final design for the project progresses and property negotiations occur.
**** Note:** Washington State Department of Transportation only acquires mitigation land from property owners willing to sell, unless it has no alternative.

Exhibit 4-12: Zoning designations in the study area

Zoning designation*	Acres	Percentage of study area	Percentage of acres acquired for right of way under the Build Alternative**	Percentage of acres acquired for wetland mitigation under the Build Alternative***
Agriculture 20 (AG-20)	38	9%	11%	0%
Rural Commercial (CR-2)	90	21%	15%	0%
Mixed Use (MX)	10	2%	2%	0%
Rural 10 (R-10)	9	2%	2%	0%
Rural 20 (R-20)	81	19%	12%	100%
Rural 5 (R-5)	99	23%	52%	0%
Rural Center District (RC-1)	44	10%	0%	0%
Regional Center (RC) (City of Battle Ground)	10	2%	6%	0%
Existing Right of Way	51	12%	0%	0%
Total	**432**	**100%**	**100%**	**100%**
			40–60 acres	**68 acres**

*** Note:** All zoning designations listed are Clark County designations, except as noted.
****Note:** Acquisition estimates are based on current design and will be refined as the final design for the project progresses and property negotiations occur.
***** Note:** Washington State Department of Transportation only acquires mitigation land from property owners willing to sell, unless it has no alternative.

The No Build Alternative would not cause any changes to land uses in the study area, as no land would be acquired for conversion to roadway or mitigation facilities.

The primary long-term land use effects of the Build Alternative would be changes in land use that would occur from acquiring land for right of way, stormwater facilities, and mitigation sites. Based on the

current level of design, 40-60 acres are being investigated for right of way acquisition on 140–160 parcels. These acquisitions would include three to seven full acquisitions, including the 68-acre Mill Creek North mitigation site, which is currently used for agriculture with an unoccupied single family residence in the R-20 zone. The total acreage of land that would be acquired would be approximately 110-130 acres. Exhibit 4-11 and Exhibit 4-12 show the distribution of acquisitions by existing land use and by zoning designation. Acquisition estimates will be refined during the final design of the project and as property negotiations take place.

Access control implemented as part of the Build Alternative would require a change in access, such as a driveway location change to a local street or consolidation of multiple driveways, for approximately 15–25 parcels currently used for commercial, residential, and agricultural purposes. However, access would be maintained for all parcels and the changes in access would not change existing land uses or prohibit the land owners from using their land in a manner allowed by the County and City zoning designations.

Washington State Department of Transportation will compensate, at fair market value, all affected property owners for property rights acquired and will provide relocation assistance in accordance with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, as well as the Washington State Relocation Assistance – Real Property Acquisition Policy (Chapter 8.26 of the Revised Code of Washington).

KEY POINT

Within the study area, land currently used for agricultural, residential, commercial and other purposes would be acquired to widen the roadway, build stormwater treatment facilities, and mitigate environmental effects under the Build Alternative. In most cases, only a strip of land along the frontage of a parcel (partial acquisition) will need to be acquired by Washington State Department of Transportation.

Only three to seven parcels are anticipated to be fully acquired. The exact amount of right of way required for the Build Alternative would not be known until final design is completed.

How many residences and businesses would be relocated as a result of the project?

See Appendix Q, *Social/Environmental Justice/Economic Discipline Report* for more details on residences and businesses in the study area, effects of the alternatives, and mitigation.

The project footprint was overlaid with property information to determine which businesses and residences along the SR 502 corridor are located within the footprint or have another facility (e.g., septic system) that would be affected by the project and require relocation of the business or residence.

Under the No Build Alternative, no land would be acquired, and no businesses or residences would need to relocate.

Approximately 140–160 parcels are being investigated for partial or full acquisition to accommodate the right of way and mitigation area needed for the Build Alternative. Although only three to seven would be full acquisitions that would result in residential and business

displacements, some of the partial acquisitions, where a strip of land adjacent to SR 502 would be acquired, would also lead to displacements due to the proximity of structures to the roadway. Approximately 25–35 residences and 22–28 commercial businesses would need to relocate under the Build Alternative based on current design; the exact right of way acquisition area will be determined during the final design process and property negotiations.

Exhibit 4-13 shows the existing land uses of the parcels that would have residential and commercial displacements. The types of commercial properties potentially displaced include auto-oriented businesses, such as a gas station or automotive station; agriculture-related businesses such as tractor sales; businesses offering specialized services including electrical or metal work; businesses that support recreational activities; local retail and food service businesses; and property owners that earn income from renting their buildings to commercial tenants.

Displacements could affect up to half of the businesses located in Dollars Corner, as shown in Exhibit 4-14. Since the study area is semi-rural in character and the availability of commercial properties is limited, it would be unlikely that all of the displaced businesses would be able to find replacement properties within Dollars Corner. Some of these businesses may be able to relocate to the remaining portion of their parcel. Replacement properties are available within the larger region, including nearby Battle Ground and the Vancouver area to the south.

Exhibit 4-13: Residential and commercial relocations due to right of way acquisition

BUILD ALTERNATIVE		
Existing land use(s)	**Percent of residential relocations ***	**Percent of commercial relocations ***
Agriculture	0%	0%
Agriculture and commercial**	0%	0%
Church	0%	0%
Commercial	0%	84%
Commercial with single family residence**	10%	16%
Public facility	0%	0%
Single family residential	31%	0%
Single family residential and agriculture**	59%	0%
Vacant	0%	0%
Total for all land uses	**100%**	**100%**
Total (number)	**25–35 relocations**	**22–28 relocations**

***Note:** Relocation estimates are based on current design and will be refined as the final design for the project progresses and property negotiations occur.
** **Note:** Parcels within more than one primary land use

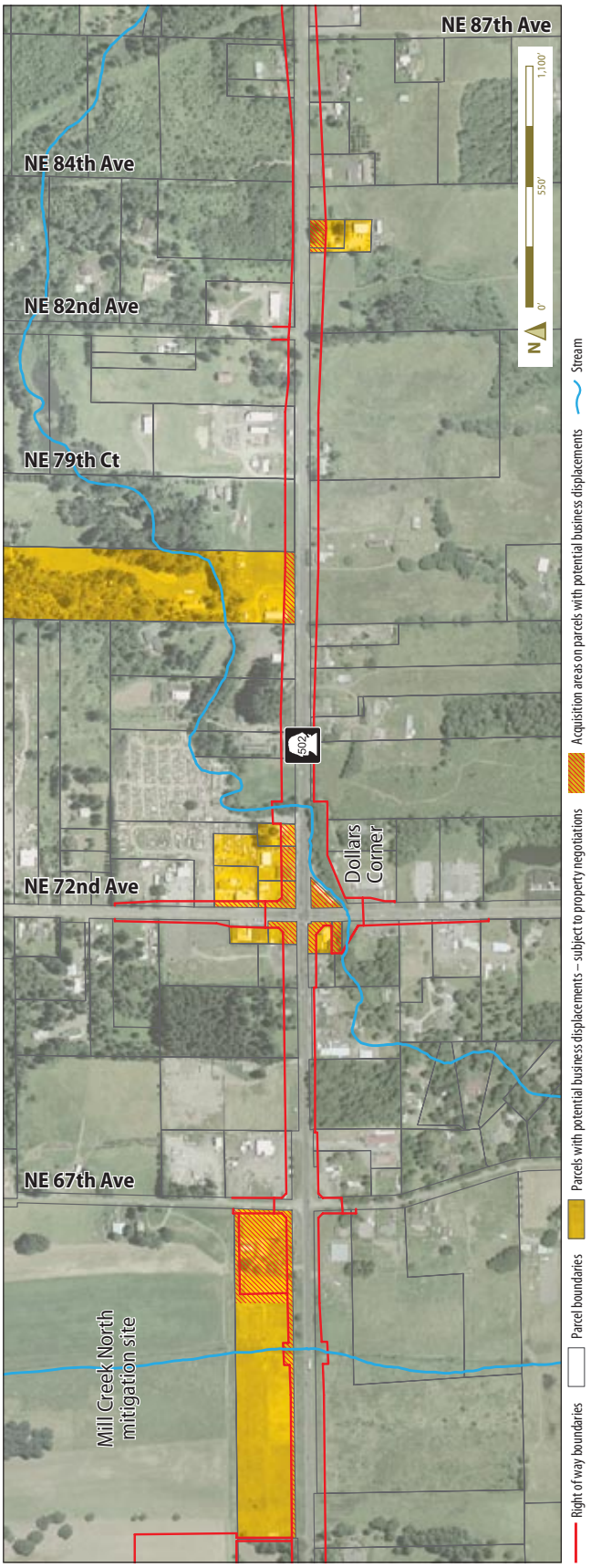


Exhibit 4-14: Parcels with potential business displacements under the Build Alternative

Similarly, because of the limited number of properties in the study area, it is unlikely that all of the displaced residences would find replacement housing in the immediate area. However, there are a wide range of residential properties relatively close to the study area where displaced residents would likely find affordable replacement housing.

Washington State Department of Transportation will compensate, at fair market value, all affected property owners for property rights acquired and will provide relocation assistance in accordance with the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, as well as the Washington State Relocation Assistance – Real Property Acquisition Policy (Chapter 8.26 of the Revised Code of Washington), as amended.

What effect would the project have on the local and regional economy?

See Appendix Q, *Social/Environmental Justice/Economics Discipline Report* for more details on the local and regional economy, effects of the alternatives, and mitigation.

Dollars Corner rural commercial center

Regionally, the study area is part of the Portland–Vancouver Metropolitan Statistical Area, which is the area for which economic data is tabulated. The Portland–Vancouver Metropolitan Statistical Area has experienced robust job growth in recent years. The majority of businesses in the project corridor are located at Dollars Corner, although there are others scattered along the rest of the corridor. There are approximately 50 businesses located in the Dollars Corner area. Many of those, including the gas station, barber shop, produce store, and restaurants, serve the daily needs of community residents. Other businesses, such as the floor covering store, landscaping business, and auto wrecking yard, serve residents and businesses in the region. Outside of Dollars Corner businesses include a sports fishing store, an auto body shop and an animal hospital.

A produce store at Dollars Corner

To obtain information on the existing economic resources the project team conducted a survey of businesses, and gathered data from sources such as the Bureau of Economic Analysis and Washington State Office of Financial Management. The purpose of the business survey was to obtain detailed information about the number and types of businesses located at Dollars Corner, their employees and customers, and on-site circulation. From this survey, it was determined that most of the businesses at Dollars Corner are small, with an average of three employees per business, and family-owned. In addition to these businesses, local residents either make their living from agricultural lands or commute to jobs in the nearby cities of Battle Ground, Vancouver, or Portland.

Property acquisitions that could result in the displacement of businesses and employees are key factors in determining how the project would affect economic resources. In addition, changes in the transportation system could alter travel routes and driveway accesses to businesses.

The long-term effects of the No Build Alternative include increased congestion on SR 502, which could make it difficult for motorists to travel to and from businesses, especially those requiring left-turns on SR 502. Congestion may also reduce pedestrian activity because it would be increasingly difficult to cross SR 502. These effects may reduce business activity.

The long-term economic effects of the Build Alternative are summarized in Exhibit 4-15. As described in the previous section and shown in Exhibit 4-14, the Build Alternative would displace approximately 22–28 businesses along the entire corridor (from NE 15th Avenue to NE 102nd Avenue), with the majority of these located at Dollars Corner. Despite the business displacements, there was strong business support for widening the existing SR 502 roadway, rather than building a new off-corridor road north or south of the existing SR 502 roadway (see sidebar). Relocation estimates are based on current design and will be refined as the final design for the project progresses and property negotiations occur.

Exhibit 4-15: Long-term economic beneficial and adverse effects

Adverse Effects
• 22–28 businesses displaced (43% to 55% of corridor businesses) based on current design
• Displaced businesses serve both local and regional customers
• Partial acquisitions would result in the loss of 25–40 parking spaces at businesses
• Driveway accesses may be modified by partial acquisitions
• 85–115 employees relocated (includes both full and part-time employment)
Beneficial Effects
• Reduced congestion and improved access
• Improved safety for all modes of travel

The business relocations would result in displacing 85–115 jobs (both full and part time). The displaced jobs at Dollars Corner are not highly specialized, so displaced employees would likely have skills that are transferable to other employment opportunities, although it is unlikely that displaced employees could find other jobs in the Dollars Corner area. Although the region is currently experiencing an economic downturn, historically Battle Ground, Vancouver and greater Clark County have experienced job growth. Therefore, in the long term, displaced employees should be able to find similar jobs in the region. The displaced businesses are a small percentage of the total number of businesses in Clark County; therefore, Clark County property tax

A typical local business adjacent to SR 502

KEY POINT

BUSINESS SUPPORT FOR ON-CORRIDOR ALTERNATIVES

On June 11, 2007, Washington State Department of Transportation met with residents and business owners to discuss the beneficial and adverse effects of widening the existing SR 502 roadway (on-corridor alternatives) or building a new road away from the existing highway (off-corridor alternatives). Business owners expressed strong support for selection of an on-corridor alternative. Despite the resulting business displacements, businesses and residents preferred an on-corridor alternative because it would keep potential customers closer to remaining businesses at Dollars Corner rather than routing them around Dollars Corner.

Prior to the meeting, more than 350 residents and businesses, including all businesses at Dollars Corner, signed a "SR 502 Petition for Straight Thru Existing Route" stating, "We the undersigned affected by this project prefer the route straight thru Dollars Corner and not deviate to the north or south of the existing route."

revenues would not be expected to decrease as a result of the Build Alternative.

With the displacement of businesses at Dollars Corner, the remaining small cluster of retail businesses may collectively attract fewer customers. However, this may be offset by project benefits that encourage customers to frequent the remaining businesses, including reduced congestion, shorter travel times, and improved safety. "Before and after" studies in other states show that the affects of median installation on businesses' deliveries, customers, and property values are much less than business owners anticipated. Customer surveys conducted as part of these studies show that the majority of drivers change their driving patterns to continue patronizing specific establishments and have no problem making u-turns to reach businesses on the opposite side of the road.

In the future, businesses may receive more customers as traffic volumes on SR 502 increase. Within the project corridor, the Build Alternative would improve mobility for all modes of traffic. At Dollars Corner, the Build Alternative would include the addition of sidewalks, marked crosswalks, pedestrian refuges, and bicycle lanes, which would improve safety for customers and employees traveling to Dollars Corner businesses. Businesses in the City of Battle Ground may also benefit from improved mobility on SR 502, which would provide regional economic benefits.

Partial acquisitions, where only a small sliver of land would be required, would result in the loss of 25–40 parking spaces at businesses. This loss of parking spaces is not expected to have a long-term effect on businesses as individual businesses would lose only a fraction of their spaces and Washington State Department of Transportation would provide mitigation for the lost spaces.

Mitigation for all properties purchased for additional highway right of way and for loss of parking spaces includes implementing the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, as well as the Washington State Relocation Assistance – Real Property Acquisition Policy (Chapter 8.26 of the Revised Code of Washington), as amended. All affected property owners would be compensated at fair market value and provided relocation assistance. In addition property owners affected by new limited access control along SR 502 would be compensated for this property right acquisition.

Would the project affect historic and archaeological resources?

See Appendix M, *Historic Resources Inventory Forms* for more detail on the significant historic resources located in the study area.

Several regulations require government, tribal and public coordination as part of studying historic, archaeological, and other cultural resources. One of the primary laws that this project must comply with is the National Historic Preservation Act, which states that the preservation of irreplaceable heritage is in the interest of the nation. As a result, federal agencies are required to consult with states, Native American tribes, local governments, and the public on the effects of their projects on cultural resources. In the case of this project, the Federal Highway Administration and Washington State Department of Transportation are responsible for complying with this law as well as other applicable federal, state and local regulations that protect cultural resources.

A systematic process was implemented to study cultural resources and consult with interested parties. The first step was to define the study area for cultural resources; this is referred to as the Area of Potential Effects. The Area of Potential Effects for this project is approximately 235 acres and includes the SR 502 roadway improvements, stormwater facilities adjacent to the roadway, and wetland mitigation sites.

The second step involves conducting an inventory of historic and archaeological resources within the Area of Potential Effects. The inventory involved a review of known historical information about the area, including historical records in Clark County and on file with the Washington State Department of Archaeology and Historic Preservation.

No Native American villages are known to have existed in the Area of Potential Effects, but it is likely that the area was used by Native American people, given the food and other resources that would have been abundant in the area. Additionally there may have been early travel corridors that Native American people used to obtain plants, stone for making stone tools, and animal resources. These items would then have been moved to camps or villages along the major streams.

Euroamericans initially settled the area in the 1860s, and much of the area has remained agricultural to the present time. Dairy farming became a major industry. As early settlers cut down trees, cattle were grazed in meadow clearings as well as those filled with stumps. The area's first cheese factory was started in 1903. By 1955, it was estimated that there were approximately 485 farms and more than 9,000 head of cattle, one-third being dairy cows, between Battle Ground and Vancouver.

KEY POINT

WHAT REGULATIONS AND STANDARDS WERE FOLLOWED TO CONDUCT THE HISTORIC AND ARCHAEOLOGICAL RESOURCES EVALUATION?

The historic and archaeological resource evaluation has been conducted to meet the requirements of Section 106 of the National Historic Preservation Act. In addition, the study meets the standards and regulations of the National Environmental Policy Act, the Washington State Environmental Policy Act, state laws addressing archaeological resources, and the Clark County's Department of Community Development Code pertaining to the identification and protection of significant archaeological sites.

DEFINITION

WHAT IS THE PROJECT'S AREA OF POTENTIAL EFFECTS (APE)?

The area of potential effects for historic resources includes the areas in which the project could have both direct and indirect effects.

A map of the project's area of potential effects is included in Appendix C, *Memorandum of Agreement for Historic and Archaeological Resources*.

KEY POINT

HISTORIC MILESTONES IN THE SR 502 CORRIDOR

- **1860s:** Euroamerican settlement
- **Late 1800s**: Roads in the Vancouver, WA area
- **1880s:** First portions of what would become SR 502
- **1930s:** SR 502 paved
- **1951:** Battle Ground incorporated

Roads reached the study area from Vancouver in the late 1800s. By the 1880s, the first portions of what would eventually become the present-day SR 502 highway had been cleared, and the road was paved in the 1930s. By that time, the town of Battle Ground had mail service and was growing. It was incorporated in 1951 and had 820 residents by 1955.

Historical research aided in determining where historic and archaeological sites were most likely to be found. Field surveys occurred from November 2007 to March 2008, from September 2008 to January 2009, and September 2009. These surveys documented historic and archaeological resources in the Area of Potential Effects, and identified a total of 89 historic resources and 19 archaeological resources.

Each of the historic and archaeological resources were evaluated to determine if any were significant in terms of meeting established criteria for listing on the National Register of Historic Places.

DEFINITION

NATIONAL REGISTER OF HISTORIC PLACES EVALUATION CRITERIA

Criteria A-D are applied to evaluate properties for nomination to the National Register. For properties to be eligible for nomination, they must meet as least one of the criteria. The quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- **A** that are associated with events that have made a significant contribution to the broad patterns of our history; or
- **B** that are associated with the lives of persons significant in our past; or
- **C** that embody distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- **D** that have yielded, or may be likely to yield, information important in prehistory or history.

Historic resources

Of the 89 historic resources, which included houses, barns, electric transmission facilities, and culverts, six resources met the eligibility criteria to be nominated to the National Register of Historic Places (Exhibit 4-16) (See Appendix D, *Agency Correspondence,* for the Washington State Department of Archaeology and Historic Preservation's concurrence on eligibility). These six historic resources are considered significant because they retain sufficient integrity and historical or architectural/engineering significance. With the exception of the Bonneville Power Administration transmission line, these resources exhibit the types of buildings and complexes common to the Battle Ground region during the first half of the twentieth century when the farming and dairying industry prevailed in the area.

The No Build Alternative would have no effect on these significant historic resources.

Two of the six significant historic resources – the J.B. Williams house and the Thomas farmstead – would be adversely affected by the Build Alternative, while the remaining four resources would either have no adverse effect or no effect.

- The J.B. Williams house is located within the direct effect area of the Mill Creek North mitigation site. This house would be demolished to accommodate the project's mitigation site.
- The Thomas farmstead is located within the direct effect area of the project, and structures on the property associated with the farmstead would be either be demolished or relocated for the roadway widening.

DEFINITION

WHAT IS THE DIRECT EFFECT AREA?

The direct effect area of the project is the area where ground disturbing activities would occur.

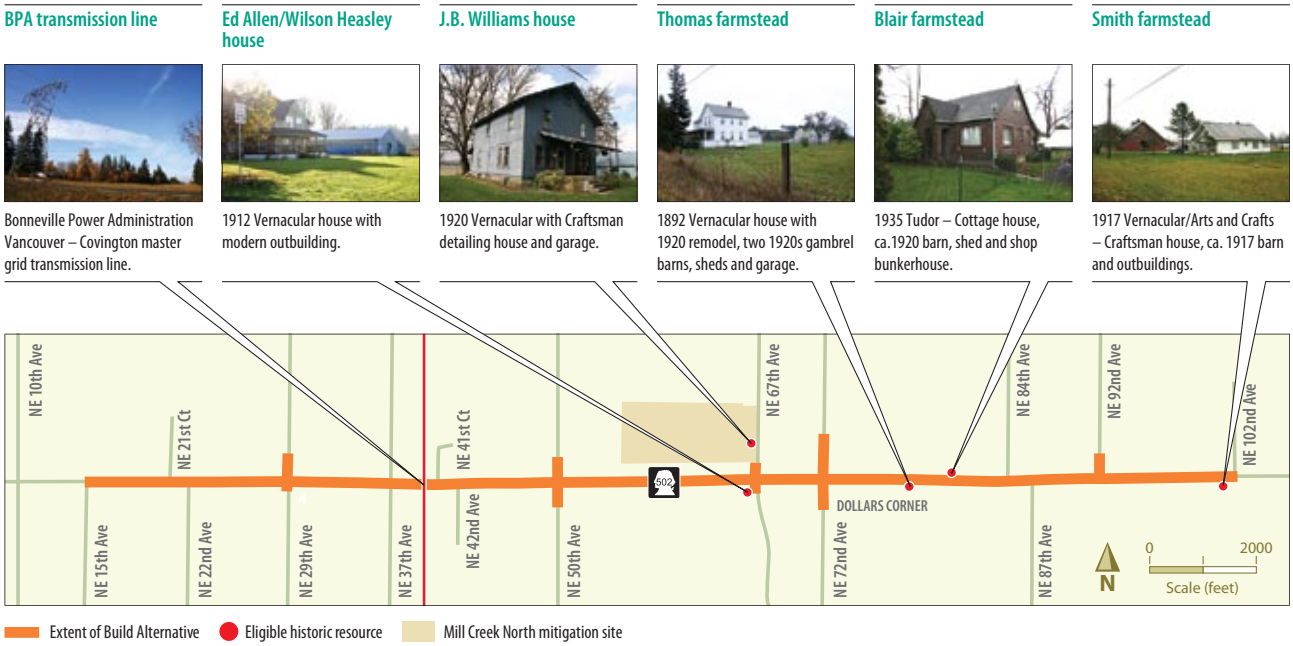


Exhibit 4-16: Historic resources eligible for listing in the National Register of Historic Places

- The Smith farmstead is located outside of, but adjacent to the direct effect area of the project. The Build Alternative would not require relocating or removing any structures to accommodate the roadway widening and would only require removing minor amounts of vegetation adjacent to the roadway. Although the vegetation that would be removed contributes to the setting of the farmstead, the significant relationship of the farm buildings to each other and as a grouping as well as the character-defining features of the structures would remain intact, and therefore, the Build Alternative would have no adverse effect on the Smith farmstead.
- The Blair farmstead is immediately adjacent to the direct effect area of the project. At this property, the buffer of trees between SR 502 and the house would be removed and the roadway would be situated closer to the house. The Build Alternative will cause no adverse effect on the Blair farmstead, because while the vegetation contributes to the setting of the farmstead, the trees are not considered an historical component of the farmstead.
- The Bonneville Power Administration Vancouver–Covington transmission line would not be directly affected by the project. Further, its setting is not a quality that defines its eligibility for listing on the National Register of Historic Places. Therefore, the project would have no effect on the historical significance of this resource.
- The Ed Allen/Wilson Heasley house is outside of, but adjacent to, the area that would be directly affected by the SR 502 roadway widening. Further, the setting of the house is not a quality that

KEY POINT

The Build Alternative would have:

- Adverse effects on the J.B. Williams house and the Thomas farmstead
- No adverse effect on the Blair farmstead and the Smith farmstead
- No effect on the Bonneville Power Administration Vancouver–Covington master grid transmission line and the Ed Allen/Wilson Heasley house.

defines its eligibility for listing on the National Register of Historic Places. Therefore, the project would have no effect on the historical significance of this resource.

KEY POINT

DOES THE PROJECT NEED TO COMPLY WITH SECTION 4(f) OF THE US DEPARTMENT OF TRANSPORTATION ACT?

Section 4(f) of the US Department of Transportation Act requires federally funded transportation projects to avoid "use" of publicly owned parks, recreation areas, wildlife and waterfowl refuges, and significant historic resources unless there are no feasible or prudent alternatives to affecting those resources. None of these resources would be affected by the project except for historic resources.

The project is eligible for federal-aid highway funds, and therefore is subject to the requirements of Section 4(f). The final Section 4(f) evaluation is located in Appendix B.

For the J.B. Williams house and the Thomas farmstead, which would be adversely affected, the Federal Highway Administration, Washington State Department of Transportation, Washington State Historic Preservation Officer, Cowlitz Indian Tribe and Chinook Tribe, and other consulting parties have signed a memorandum of agreement specifying mitigation measures which would be implemented for these resources. A copy of the memorandum of agreement, signed on January 14, 2010, is included in Appendix C, *Memorandum of Agreement for Historic and Archaeological Resources*.

Archaeological resources

Nineteen archaeological sites also were identified during field surveys. Shovel testing and larger test units were excavated at these sites to assess the potential for buried archaeological materials. Of the 19 sites, 16 have prehistoric artifacts, one has historic-period artifacts, and two have both historic-period and prehistoric artifacts:

DEFINITION

WHAT IS DEBITAGE?

Debitage is the flaking by-products that result from working rough stone into tools.

- Artifacts at the 16 prehistoric sites were generally similar and included fire-cracked rocks, stone flakes, called debitage, from making and maintaining stone tools, flaked cobbles, and occasionally other stone artifacts.
- Artifacts at the one historic-period site were a piece of ceramic and a nail.
- Two sites had both historic-period artifacts and prehistoric artifacts. For one site, the historic-period artifacts were on the periphery of the site and were a few machine-cut nails and a piece of window glass. This site revealed a relatively large number of prehistoric artifacts and deeper deposits that may allow a date for the site to be assigned. The prehistoric artifacts consist of numerous fire-cracked rocks and pieces of debitage as well as 10 tools that include a projectile point tip, 1 hammerstone (for making stone tools), 3 flaked tools (probably used for cutting and scraping), 2 cores, 2 choppers, and an abrader. The core area of the prehistoric component has intact deposits and has retained integrity, and so the prehistoric component of this site is significant and eligible for nomination to the National Register of Historic Places under Criterion D.

  The other site with both historic-period artifacts and pre-historic artifacts contains very sparse pre-historic debitage, fire-cracked rock fragments, and sparse historic-period artifacts within shallow depths. Because this site has been extensively disturbed through agricultural

activities and has a sparse distribution of artifacts, it did not meet the eligibility criteria for listing in the National Register of Historic Places.

The excavations revealed that the 17 sites with only prehistoric or historic-period artifacts had few artifacts, and these did not allow the sites to be assigned a date. In addition, these 17 sites lacked integrity due to agricultural disturbance and other development in the area. Therefore, a total of 18 sites did not meet the eligibility criteria for listing in the National Register of Historic Places. The Washington State Department of Archaeological and Historic Properties concurred with these findings (See Appendix D, *Agency Correspondence*).

The No Build Alternative would have no effect on the significant prehistoric archaeological resource. Similarly, the Build Alternative would not cause any ground disturbance to this significant resource and therefore would have no adverse effect to archaeological resources.

Additionally, an inadvertent discovery plan would be developed and implemented during construction. This plan would specify a protocol for halting construction work if unidentified archaeological resources or human remains are encountered. Various government agencies and tribes would be notified so that the significance of the discovery could be evaluated and the appropriate course of action could be implemented.

A few areas within the Area of Potential Effects were not accessible during the archaeological surveys. These remaining properties would be surveyed and evaluated prior to construction. Stipulations for these surveys and evaluations are also included in the memorandum of agreement (January 14, 2010) prepared for the project (See Appendix C, *Memorandum of Agreement for Historic and Archaeological Resources*).

How would the project affect parks, recreation, and open space?

See Appendix O, *Land Use/Agriculture and Farmland/Public Lands/Relocations and Right of Way Acquisitions Discipline Report* for more details on parks, recreation and open space in the study area, effects of the alternatives, and mitigation.

Currently there are no existing parks, special use areas, designated open space, or other types of designated public lands within the study area. There are six publicly-owned parcels, but they are not open to the general public or used for recreational purposes. These publicly-owned parcels are owned by the State of Washington, Bonneville Power Administration, and Clark County Fire and Rescue.

According to the 2007 *Vancouver–Clark Parks and Recreation Comprehensive Parks, Recreation and Open Space Plan*, the guiding

KEY POINT

There are no outdoor recreation facilities in the study area that were acquired or developed with Section 6(f) of the Land and Water Conservation Fund Act funding, and therefore a Section 6(f) evaluation is not required for the SR 502 Corridor Widening Project.

KEY POINT

There are no identified public parkland resources that would be protected under Section 4(f) of the US Department of Transportation Act, which applies to federally sponsored or funded projects.

policy document for the parks and open space areas of the City of Vancouver and Clark County, acquisition of approximately 200 acres for a proposed regional park is planned near the study area approximately two miles east of NE 72nd Avenue and approximately one-half mile north of SR 502. The *Vancouver–Clark Parks Comprehensive Parks, Recreation and Open Space Plan* also identified the SR 502 corridor as having existing on-street bicycle routes.

SR 502 is not designated as a regional trail although areas of existing shoulders function as on-street bicycle and sidewalk facilities. The *Cycling Clark County Washington* bicycle map identifies SR 502 as a shared roadway. The City of Vancouver and Clark County have completed a comprehensive trails and bikeway system plan, the *Regional Trail and Bicycle Bikeway Systems Plan* which acknowledges SR 502 between I-5 and the City of Battle Ground as a newly identified trail corridor because of planned bicycle and pedestrian elements along the corridor.

The *Regional Trails and Bikeway Systems Plan* lists a proposed trail that would be within the study area: the North–South Powerline Trail. The proposed, 20-mile regional north-south trail would be equidistant between and parallel to NE 29th and NE 50th Avenues and would intersect with SR 502. If the trail was constructed, the Build Alternative could enhance sight distance for trail users. The median treatment would require pedestrians, bicyclists, and equestrians using the trail to travel to a signalized intersection at NE 29th Avenue or NE 50th Avenue in order to cross SR 502 before continuing along the north–south trail, or the trail would have to provide an overpass across SR 502.

The six publicly-owned parcels in the study area could be affected by right of way acquisition. Three of the parcels are owned by the State of Washington, one of which is vacant and the other two each have a single family residence. One of these parcels would be the location of the Mill Creek North mitigation site and would be used in its entirety for the project. It is estimated that less than one acre of right of way would be required from each of the other State of Washington-owned parcels. Two of the other parcels are owned by Clark County Fire and Rescue, which are used for the fire station building and parking lot. Less than 0.1 acre would be acquired from the fire station and parking lot area; the building would remain intact and no loss in parking is anticipated. The sixth property is owned by Bonneville Power Administration. Washington State Department of Transportation may purchase an easement on the Bonneville Power Administration parcel; the remainder of the parcel would be able to retain its current use and the transmission line would not be affected.

DEFINITION

WHAT IS AN EASEMENT?

An easement is a legal right to use property owned by someone else for a designated purpose.

How would the project affect neighborhoods?

See Appendix Q, *Social/Environmental Justice/Economics Discipline Report* for more details on neighborhoods in the study area, effects of the alternatives, and mitigation.

KEY POINT

Some of today's residents in the community are descendants of the early settlers of Clark County.

The study area is located in a semi-rural unincorporated area of Clark County. This area was settled by farmers in the late 1800s and some of the descendants of these historic settlers still reside in the community. Between 1990 and 2000 the population of the study area grew 53 percent from 4,400 to 6,700 residents; however, since 2000 the population has only grown six percent to 7,100 residents.

Sources of information on the neighborhoods within the project corridor include federal, state, and local agencies. Information was also gathered from a wide variety of public coordination and outreach methods that were conducted, such as key stakeholder interviews, public scoping and open house meetings, and the project website.

Because the study area is semi-rural there are limited community facilities and public services available for local residents. There are no hospitals, schools, libraries, or parks located in the study area, though a number of these community facilities are located in nearby Battle Ground, which is directly east of the study area, or in Vancouver approximately five miles to the south. Of the community facilities and services within the study area, most are located at Dollars Corner, which is a county designated rural commercial center. These facilities include: several restaurants, a fraternal organization, and a fire station. Other community facilities and public services in the study area include patrol by the Clark County Sheriff's Office, three existing churches and one church currently under construction, and the Battle Ground Veterinary Hospital. SR 502 is the main transportation facility. It is intersected by county roads. There are very few sidewalks or crosswalks in the area. SR 502 has existing shoulders, with widths varying between three and six feet, on either side of the roadway and is designated an on-street bicycle route.

SR 502/NE 50th Ave intersection looking east

DEFINITION

WHAT IS COMMUNITY COHESION?

The ability of people to communicate and interact with each other in ways that lead to a sense of community, as reflected in the neighborhood's ability to function and be recognized as a singular unit.

The project area has good community cohesion. One of the strongest aspects of community cohesion in the study area is the relatively similar and stable population. Dollars Corner is the hub of activity in the community, providing places for neighbors to "bump" into one another. For the neighborhoods within the project corridor, SR 502 acts as both a life-line for regional travel and a barrier within the community as traffic volumes have increased in recent years.

In the long-term, the No Build Alternative would not directly affect the study area neighborhoods. However, there would be increasing traffic volumes and associated congestion on SR 502 that could affect

community facilities and public services (such as delaying response times for emergency services), travel patterns, and public safety as drivers would likely take risks when deciding to turn left across on-coming traffic. The increased congestion associated with the No Build Alternative would not substantially change community cohesion as the highway is already a barrier.

Rural residence along the SR 502 corridor

The long-term beneficial and adverse effects of the Build Alternative to neighborhoods are summarized in Exhibit 4-17. The widening of SR 502 would require the full or partial acquisition of a substantial number of properties along the corridor and would result in the displacement of 25 to 35 residences. Together, the residential displacements represent approximately 30 percent of all residences abutting the project corridor and would require the relocation of an estimated 75 to 105 persons. Relocation estimates are based on current design and will be refined as the final design for the project progresses and property negotiations occur. The relocation of residents would affect the current stability of the population within the study area, which would have an adverse effect on neighborhoods and the community cohesion. Based on 2008 Regional Multiple Listing Service data, displaced residents would likely be able to find affordable replacement housing relatively close to the study area. Some of the remaining residents would be affected by partial acquisitions that would require the relocation of on-site wells or septic systems.

Exhibit 4-17: Long-term neighborhood beneficial and adverse effects

Adverse effects
• 25–35 dwellings displaced (30% of corridor residences) based on current design
• 75–105 persons relocated (assumes 3.0 persons per household)
• Decreased community cohesion due to changes to the population stability and a reduction in the number of gathering places at Dollars Corner
• Partial acquisitions would require some residences to relocate their on-site septic systems or wells, or to hookup to new waterlines
• High level of highway traffic continues to act as a community barrier
Beneficial effects
• Reduced travel time through corridor to access businesses and services in nearby Ridgefield and Battle Ground as well as jobs in Vancouver
• Shorter travel time for police, fire and emergency medical vehicles
• Increased pedestrian and bicycle safety
• Increased vehicle safety

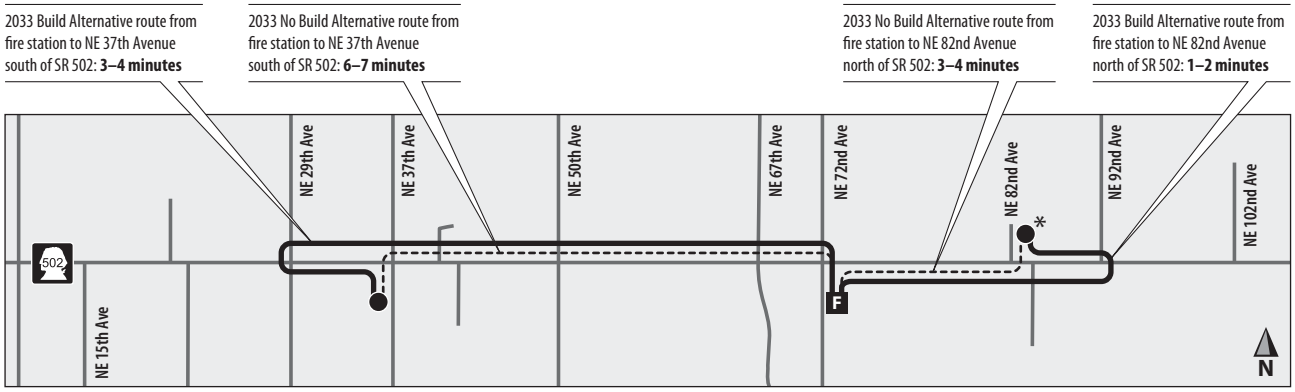
The displacement of businesses at Dollars Corner may also have an adverse effect on community cohesion because the businesses in this area provide gathering places for the neighborhood. Many of the businesses where neighbors may currently interact with each other would be relocated. The addition of sidewalks, marked crosswalks, pedestrian refuges, and bicycle lanes at Dollars Corner may benefit

community cohesion as it would increase the safety for residents to walk among the remaining businesses, which could increase the opportunity for neighbors to interact.

Potential effects on the larger community would be mixed. The Build Alternative would not require the relocation of community facilities or public services. Community mobility, including travel for bicyclists and pedestrians, would be improved. In addition to the pedestrian and bicycle improvements at Dollars Corner, safety also would be improved for pedestrians and bicyclists traveling along the highway by the construction of 10 foot wide shoulders. Mobility and access to destinations outside of the community would be greatly improved.

The Build Alternative would substantially reduce emergency services response times from the fire station located on NE 72nd Avenue approximately one-quarter mile south of SR 502 at Dollars Corner (Exhibit 4-18). The Build Alternative would increase the capacity of the roadway, control access points along the roadway, and improve control at intersections. Thus, emergency response time would be less than if the project was not built.

The fire station on NE 72nd Avenue



F Fire station — 2033 Build Alternative emergency response route ---- 2033 No Build Alternative emergency response route

*** Note:** If the directional median opening east of Dollars Corner is located at NE 82nd Ave, emergency vehicles could turn left directly onto NE 82nd Ave, further reducing response times.

Exhibit 4-18: Emergency response times in 2033 under the Build Alternative and the No Build Alternative

Mitigation for properties purchased for needed right of way includes implementing the provisions, including compensation and relocation assistance, of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, as well as the Washington State Relocation Assistance – Real Property Acquisition Policy (Chapter 8.26 of the Revised Code of Washington). The available housing in the vicinity is expected to provide suitable relocation housing for displaced residents, but if sufficient numbers of comparable replacement housing are not available housing of last resort would be provided. Property owners affected by new limited access control along SR 502 were notified through Washington State Department of Transportation access control hearing procedures.

DEFINITION

WHAT IS HOUSING OF LAST RESORT?

The Uniform Relocation Assistance and Real Property Acquisition Policies Act requires that comparable decent, safe, and sanitary replacement housing within a person's financial means be made available before that person may be displaced. When such housing cannot be provided by using replacement housing payments, the Act provides for "housing of last resort." This housing may involve the use of replacement housing payments that exceed the Act's maximum amounts.

How would minority, low-income, elderly, and disabled populations be affected by the project?

See Appendix Q, *Social/Environmental Justice/Economics Discipline Report* for more details on minority, low-income, elderly, and disabled populations in the study area, effects of the alternatives, and mitigation.

DEFINITION

WHAT IS ENVIRONMENTAL JUSTICE?

Environmental justice refers to the process of identifying and addressing disproportionately high and adverse human health and/or environmental effects on minority and/or low-income populations.

DEFINITION

WHAT IS A LOW-INCOME HOUSEHOLD?

A low-income household is one that is at or below the US Department of Heath and Human Services poverty guidelines based on household size.

DEFINITION

WHAT RACE OR ORIGIN IS CHARACTERIZED AS A MINORITY?

A minority is a person who is:

- Black (a person having origins in any of the black racial groups of Africa),
- Hispanic (a person of Mexican, Puerto Rican, Cuban, Central or South American, or the Spanish culture or origin, regardless of race),
- Asian/Pacific Islander (a person having origins in any of the original peoples of the Far East, Southeast Asia, the Indian subcontinent, or the Pacific Islands),
- American Indian or Alaskan Native (a person having origins in any of the original peoples of North America, and who maintains cultural identification through tribal affiliation or community recognition).

In order to comply with Presidential Executive Order 12898 on environmental justice, Washington State Department of Transportation and the Federal Highway Administration are required to analyze whether the project would have disproportionate adverse effects on minority and low-income populations.

Within the study area there are minority and low-income residents, minority-owned businesses, and businesses that employ minority persons. Minority persons most represented in the community are Hispanics. The proportion of the study area's population that is minority or low-income is very similar to adjacent communities and the overall population of Clark County. Statistics indicate that 9.6 percent of the study area's population is minority and 5.1 percent is low-income (Exhibit 4-19). Persons of Hispanic origin comprise approximately 3.2 percent of the total population within the study area. This is less than the proportion for the population of nearby cities and the county. Contact with a local social service agency confirmed that Hispanics and Russians are the predominant groups represented in the local population that may speak languages other than English.

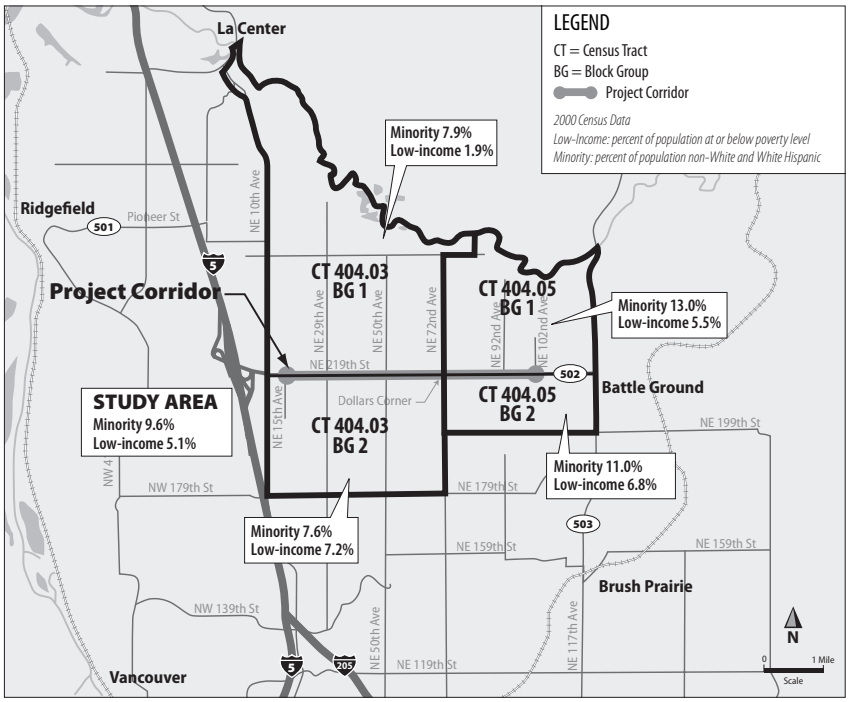


Exhibit 4-19: Distribution of minority and low-income populations

The proportion of elderly persons within the study area is 9.8 percent, which is slightly more than the proportion of elderly persons for Clark County (9.5 percent), but lower than the percent of elderly population in Washington State (11.2 percent). The proportion of disabled persons is 5 percent, which is similar to the proportion for Clark County (5 percent), but higher than for Battle Ground (4 percent).

Under the No Build Alternative, there would be no long-term effects that would result in disproportionate adverse effects on minority or low-income population groups in the study area. The No Build Alternative would also not have long-term effects on elderly or disabled populations in the study area.

To assess compliance with federal and state policies and laws pertaining to environmental justice, an analysis was conducted for the Build Alternative to determine whether any project effects would disproportionately affect minority and low-income members of the community. It was determined through the analysis that minority or low-income populations would not be disproportionately affected; the project's effects would not be appreciably more severe to these populations compared to the whole community.

As described in the Economy section, a business survey was conducted which identified businesses at Dollars Corner that are minority-owned, employ minority persons, and/or provide services to minority and/or low-income persons. There are two minority-owned businesses within the project corridor; however, neither of the minority-owned businesses would be displaced under the Build Alternative. As such, adverse effects on minority and low-income populations in the study area are not expected to be disproportionate.

With the Build Alternative, the long-term effects of increased noise, light and glare, and air pollution would affect minority, low-income, elderly, and disabled populations in the study area. These effects are not expected to be felt by these populations to a greater degree than the general population.

Community outreach will continue throughout the environmental review process and project construction, and will be used to record the concerns of minority, low-income, elderly, and disabled populations in the community. Public outreach materials will continue to provide contact information in Spanish and Russian to ensure people who speak languages other than English can access project information.

DEFINITION

WHAT AGE IS CHARACTERIZED AS ELDERLY?

Elderly populations are people aged 65 years and over.

DEFINITION

WHAT IS A DISABILITY?

Generally, the US Census defines a person with a disability as having a long-lasting condition, such as severe vision or hearing impairments, or a condition that substantially limits basic physical activities. It may also include people with conditions that make other activities such as learning, getting around inside the home, working at a job, or going places outside the home difficult.

DEFINITION

WHAT IS A DISPROPORTIONATE ADVERSE EFFECT?

These are adverse effects that are predominately felt by a minority or low-income population that would suffer appreciably more than suffered by non-minority and/or non-low-income populations.

KEY POINT

On July 26, 2009, Washington State Department of Transportation held an open house to share information on several projects, including SR 502, with the Hispanic community. The meeting was held following Spanish mass at a local church. Spanish interpreters were available, and project informational flyers and meeting materials were provided in both Spanish and English. Advertisements for the open house were published in *El Hispanic News* and *Latin News*.

KEY POINT

Though minorities and low-income persons reside and work in the study area, there would be no disproportionate adverse effects on these populations.

How would the project affect the visual quality and the character of views?

See Appendix T, *Visual Quality Discipline Report* for more details on visual quality and the character of views in the study area, effects of the alternatives, and mitigation.

Within the study area four visually distinct landscape units were identified using methodology from the Federal Highway Administration *Visual Impact Assessment for Highway Projects*. Within each landscape unit representative views were selected to document the existing visual quality and to analyze the proposed visual quality. The four landscape units, identified as A through D, and the locations of the representative views are shown on Exhibit 4-20.

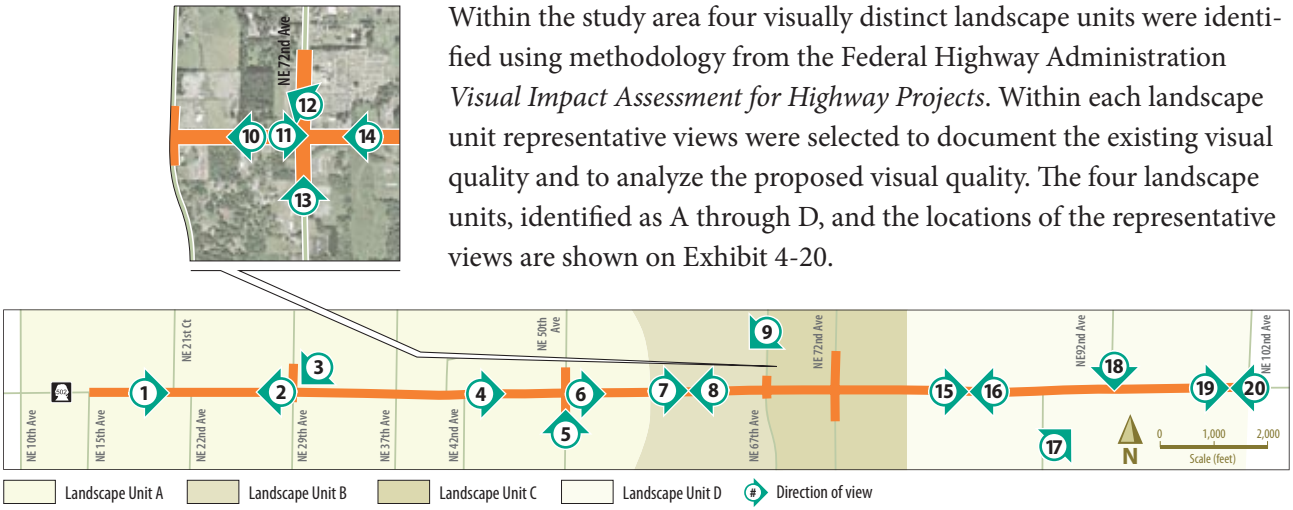


Exhibit 4-20: Landscape units and view locations

DEFINITION

WHAT ELEMENTS ARE EVALUATED TO MEASURE VISUAL QUALITY?

- **Vividness:** The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern. Four components constitute vividness: landform, vegetation, water, and man made development.
- **Intactness:** The integrity of visual order in the natural and human-created landscape, and the extent to which the landscape is free from visual encroachment. Intactness considers the overall intactness of the view and the level of encroachment upon the view.
- **Unity:** The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony or intercompatibility between landscape elements. Unity considers the overall unity of a view as well as the unity between man made and natural resources.

For each landscape unit the visual quality was evaluated by scoring views from and toward SR 502 on three components: vividness, intactness, and unity. The three components were rated on a scale of 1 to 7, with 7 being the highest rating and 1 being the lowest rating. The visual quality of each view is the average of these ratings.

The Washington State Department of Transportation *Roadside Classification Plan* (1996), currently classifies SR 502 as rural. The existing visual quality of Landscape Units A and D is moderately high (5); visual resources, such as vegetation, blend fairly well and create a mostly organized, harmonious view. Landscape Unit A can be visually characterized as a rural residential area. Landscape Unit D is a mixture of rural residential and rural commercial. In these units SR 502 bisects the view and is the visually dominant element.

Landscape Unit B can be visually characterized as a large, intact, agricultural field. The existing visual quality of Landscape Unit B is high (6) because it has a harmonious appearance and few visual distractions, such as vehicle congestion, signs, and above-ground utilities. The existing visual quality of Landscape Unit C is low (2). Landscape Unit C includes Dollars Corner, which is characterized by visual distractions from signs, signals, lights, and above ground utilities.

In all four landscape units the long-term visual effects of the No Build Alternative would be the increased visual distraction, light, and glare from increased vehicle congestion. This would not change the existing visual quality rating of the landscape units.

The Build Alternative would result in a long-term decline in the visual quality of Landscape Units A, B and D (Exhibit 4-21); however, the change would be considered minor. The slight decline is mostly due to: vegetation removal, widened roads and expanded intersections, and the increased bisecting effect of a four-lane highway compared to a two-lane highway.

New signs, signals, lights, and the raised median treatment would increase the road's visual dividing effect. The visual quality of Landscape Units A and D would decrease from moderately high (5) to average (4). In Landscape Unit B, the visual quality would be affected by vegetation removal. However, while many mature trees would be removed, large areas of wetland vegetation would remain on either side of SR 502 and, other than those removed for widening, most leaf-bearing and pine trees would remain. The visual quality of Landscape Unit B would decrease from high (6) to moderately high (5). The photosimulation in Exhibit 4-22 shows the approximate visual change that would occur along SR 502 in Landscape Unit B.

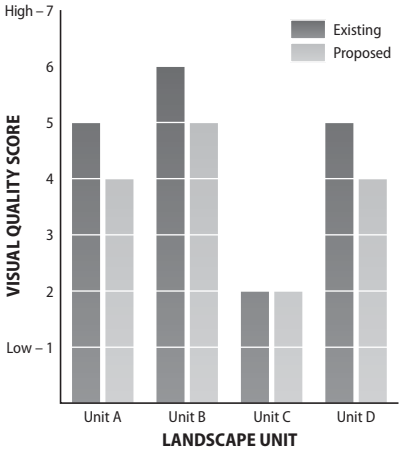


Exhibit 4-21: Existing and proposed visual quality scores by landscape unit

Exhibit 4-22: Landscape Unit B simulation – existing and proposed views

Landscape Unit B midpoint looking west along SR 502 – existing view

Landscape Unit B midpoint looking west along SR 502 – proposed view showing median barrier

The visual quality of Landscape Unit C would remain the same. In Landscape Unit C, the beneficial and adverse visual effects of the Build Alternative would balance each other. The scale of the widened highway and intersection would be dominant; light and glare from vehicles could affect a wider area as a result of the increased highway capacity; and removing buildings may expose other potentially unsightly buildings and facilities. However, visual clutter would be removed or consolidated, and the intersection would be more visually ordered with curbs, sidewalks, crosswalks and designated turn lanes.

Overall, the Build Alternative would not be expected to result in a change to the rural roadside classification of SR 502. The roadside character may change over time as a result of development within this area; however, the Build Alternative itself would not cause this change.

View 2: Looking west along SR 502 from NE 29th Avenue (Landscape Unit A)

View 9: NE 67th Avenue looking southwest toward SR 502 (Landscape Unit B)

View 15: SR 502 looking east from west of NE 87th Avenue (Landscape Unit D)

View 11: SR 502 looking east towards NE 72nd Avenue (Landscape Unit C)

Beneficial visual effects of the Build Alternative would include a reduction in light, glare, and the visual distraction of congestion. In addition, the Build Alternative has been designed to minimize effects on visual quality. For example, the design minimizes the footprint width and vertical profile, and the alignment meanders slightly to avoid environmentally sensitive areas. Additional mitigation for long-term visual quality effects include using luminaires and signs that are consistent with the interchange where SR 502 connects with I-5, and implementing the Roadside Classification Plan policies to restore and blend disturbed areas with the surrounding landscape.

Would the project be compatible with applicable local, regional and state plans?

See Appendix O, *Land Use/Agriculture and Farmland/Public Lands/Relocations and Right of Way Acquisitions Discipline Report* for more details on local, regional and state plans, and the alternatives' consistency with these plans.

The following plans and development regulations were reviewed to determine if the No Build and Build Alternatives are consistent with them:

- Battle Ground Comprehensive Parks, Recreation, and Open Space Plan (2005)
- City of Battle Ground Comprehensive Plan 2004–2024
- City of Battle Ground Municipal Code, including Zoning (Title 17) and Environmental (Title 18)
- City of Battle Ground Transportation System Plan 2005–2025
- Clark County Code, including Unified Development Code (Title 40)
- Clark County Comprehensive Growth Management Plan 2004–2024
- Clark County Shoreline Management Master Program (1974)
- Metropolitan Transportation Plan for Clark County (2007)
- State Transportation Improvement Program (2007)
- Vancouver Comprehensive Plan 2003–2023
- 2007–2012 Clark County Transportation Improvement Plan
- Vancouver-Clark Parks and Recreation Comprehensive Parks, Recreation and Open Space Plan (2007)
- Washington Transportation Plan 2007–2026

The following is a summary of the themes expressed in these plans:

- **Development of a multi-modal transportation system that facilitates movement of vehicles, pedestrians, bicyclists, and transit.** The project would include sidewalk, pedestrian, and bicycle improvements that facilitate a transportation system which promotes

a variety of modes of transportation. Improvements to the roadway would also facilitate movement of transit vehicles that connect residents of Battle Ground and other places in north Clark County, such as Yacolt, to Vancouver and the Portland metro area.

- **Integration of land use and transportation projects to create a livable and vibrant community; facilitation of growth in strategic areas in compliance with comprehensive plan designations.** The project is a major component of the City of Battle Ground and Clark County planned transportation networks and is integrated into the comprehensive plans, which designate areas of future growth. This project would support the continuation of the commercial area at Dollars Corner. Lands adjacent to SR 502 and currently designated in the *Clark County Comprehensive Growth Management Plan* for commercial or mixed use purpose would use SR 502 for access. Washington State Department of Transportation would acquire limited access control to establish safe and reasonable access to property along SR 502.
- **Avoidance and minimization of negative effects to environmental resources.** To the extent possible, the Build Alternative's right of way alignment minimizes effects to natural resources. Utilizing the existing right of way and improving the existing highway minimizes the overall "footprint" of the project and reduces the amount of resource land that would be converted to right of way. Effects to wetlands would be mitigated at the Sunset Oaks wetland mitigation site and the Mill Creek North mitigation site, and any other mitigation sites identified for the project.

Based on review of these plans, and confirmed through discussions with Clark County and City of Battle Ground staff, the No Build Alternative was found to be generally inconsistent with six of these plans. The No Build Alternative would retain the existing facility without improvements, and would not support many of the major goals and objectives identified in the *Clark County Comprehensive Growth Management Plan*, *City of Battle Ground Comprehensive Plan*, *City of Battle Ground Transportation System Plan*, *Metropolitan Transportation Plan*, *Washington Transportation Plan*, and *State Transportation Improvement Program*. Specifically, the No Build Alternative would not improve mobility and safety, nor would it facilitate access between I-5, the City of Battle Ground, and other incorporated areas of Clark County targeted for future urban growth.

The Build Alternative would be generally consistent with all applicable plans and is supportive of the goals and policies established by local agencies.

How would the project affect traffic sound levels?

See Appendix P, *Noise Discipline Report* for more details on noise levels in the study area, effects of the alternatives, and mitigation.

DEFINITION

WHAT IS NOISE?

The Washington Transportation Commission's Policy Catalog 6.3.7 defines noise as a form of pollution which increases when transportation volume and speeds increase, and which may result from land, water, and air-based systems. Noise detracts from environmental quality and is ultimately linked to transportation policy.

Currently, traffic sound is the predominant source of sound in the study area. Because sound levels are affected by the speed of vehicles as well as the amount of traffic, peak sound levels occur at times when traffic volumes are heavy, but still moving at or near the posted speed limit. The project team measured existing peak sound levels at 10 locations along the SR 502 corridor, and modeled sound levels at an additional 51 sites using the Federal Highway Administration Traffic Noise Model. These 61 sites represent various locations sensitive to traffic sound in the study area, and typically correspond to locations within 500 feet of the pavement edge of the roadway. In some cases, a single monitoring site may represent several nearby noise sensitive sites.

KEY POINT

HOW IS SOUND MEASURED?

Sound levels are measured in decibels, a unit of relative sound intensity. For highway traffic sound, an adjustment, or weighting, of the high and low-pitched sounds is made to approximate the way that most people hear sound. The adjusted sounds are called A-weighted levels.

Exhibit 4-23: Federal Highway Administration's noise abatement criteria

Activity category	Hourly continuous noise level (Leq (h), decibel)	Description of activity category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B.
D	–	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: US Department of Transportation, 1982.

DEFINITION

WHAT IS A NOISE EFFECT?

A noise effect refers to locations where traffic noise is high enough or has increased enough to warrant consideration of noise abatement measures. The Washington State Department of Transportation *Traffic Noise Analysis and Abatement Policy* considers a noise effect present when a project results in an increase of 10 decibels or more, or results in noise levels within one decibel of the Federal Highway Administration noise abatement criteria. These criteria specify different noise thresholds depending on the use of the adjacent property. For further details, see Appendix P, *Noise Discipline Report*.

The Washington State Department of Transportation *Traffic Noise Analysis and Abatement Policy* (2006) considers receptors to be affected by traffic sound if they approach or exceed the Federal Highway Administration noise abatement criteria (see Exhibit 4-23). Washington State Department of Transportation considers predicted sound levels within one decibel of the noise abatement criteria to be a traffic noise effect. Increases in traffic sound of 10 decibels and greater are considered substantial increases.

Today, traffic sound levels at locations along SR 502 range from 46 decibels to 66 decibels. One of the 61 locations evaluated, a residence, currently experiences high enough sound levels to be considered a traffic noise effect under established federal and state criteria.

Sound levels in the study area will increase over time as a result of higher traffic volumes. Under the No Build Alternative, traffic sound is expected to increase by 0–5 decibels along the corridor. Sound levels at 15 out of 61 modeled sites would meet or surpass levels established for noise effects, and would range from 66–70 decibels at these affected sites. These affected sites represent 34 residences and one church (Exhibit 4-24).

Greater increases in sound levels are expected under the Build Alternative, since the widened roadway would bring vehicle traffic closer to the monitored sites. The Build Alternative would also result in higher traffic volumes traveling at or near the speed limit. Traffic sound levels are expected to increase by 1–11 decibels under the Build Alternative when compared to existing levels. Noise effects, ranging from 66–73 decibels, would occur at 96 residences and three churches. However, approximately 26 of these affected residences would be displaced by the Build Alternative. These residents would be relocated further away from SR 502 and would not experience the noise effects at their new locations. The remaining 70 residences along SR 502 would have noise effects that exceed the noise abatement criteria (Exhibit 4-24).

Exhibit 4-24: Comparison of locations affected by traffic noise

Alternative / conditions (year)	Residences with noise effects†	Churches with noise effects	Noise levels at affected sites
Existing Conditions (2006)	1	0	66 decibels
No Build Alternative (2033)	34	1	66–70 decibels
Build Alternative (2033)	70*	3	66–73 decibels

† "Noise effects" is as defined by federal/state criteria.
* The number of residences does not include those residences that would be displaced or relocated prior to construction of the Build Alternative. Twenty-six residences would be affected after relocations are complete.

For the residences and churches that would experience sound levels that exceed the noise abatement criteria, measures were considered to reduce these noise levels. Examples of measures to reduce, or abate, noise include:

- Speed reduction actions to minimize roadway noise if warranted by a traffic study
- Acquiring land for noise buffer zones
- Realigning the roadway
- Sound insulation of public use structures
- Construction of noise barriers or berms

DEFINITION

WHAT IS AN HOURLY CONTINUOUS NOISE LEVEL?

Highway traffic noise levels are always changing. As the traffic volume, type and speed of vehicles producing the noise vary, so do the noise levels. Because of these time-related variations in traffic noise on a highway, it is more convenient and practical to convert all the different noise levels for a given time period into a single representative noise level. One of the more common descriptors used to characterize the fluctuating noise levels is called the Equivalent Sound Level or Leq. For traffic noise studies, Leq is usually evaluated over a one-hour time period and is denoted as Leq(h).

KEY POINT

Noise abatement measures must be feasible and reasonable. The Washington State Department of Transportation Traffic Analysis and Abatement Policy defines these criteria. "Feasible" requires that the measure provide a substantial (at least seven decibels) reduction in noise and other constructability issues. "Reasonable" refers to the maximum cost per residence benefiting from the noise mitigation.

Each measure was analyzed to determine if it would provide at least seven decibels of noise reduction (feasibility test) and if it would be cost effective to implement (reasonableness test). The residences and churches along SR 502 are generally on large parcels and located far apart. A noise barrier for noise abatement would not be feasible because it would not achieve a seven decibel noise reduction, and it would not be reasonable because the barrier would not be cost effective. The results of this analysis indicated that none of the measures would be feasible and reasonable, so no noise abatement measures are proposed for the Build Alternative.

DEFINITION

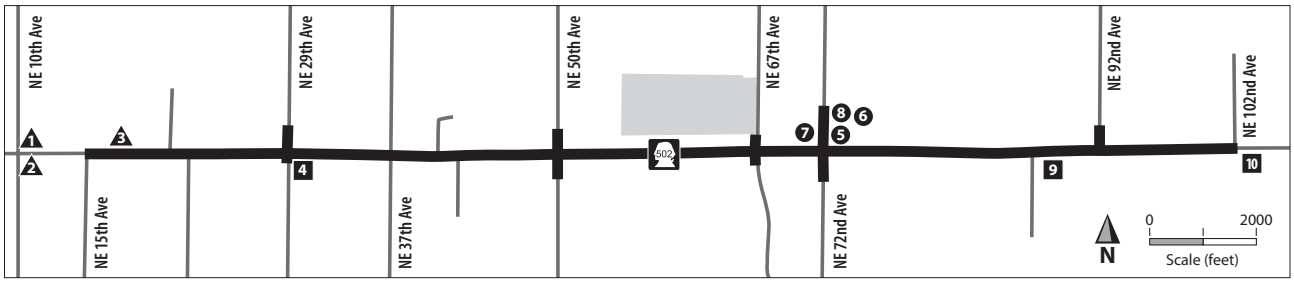
WHAT ARE HAZARDOUS MATERIALS?

Hazardous materials are any medium that contains organic or inorganic constituents considered toxic to humans or the environment. This term includes dangerous waste, problem waste, petroleum product, and hazardous substances.

Are there hazardous materials in the study area?

See Appendix L, *Hazardous Materials ISA-Level Discipline Report* for more details on hazardous materials in the study area, effects of the alternatives, and mitigation.

Ten sites with suspected or known hazardous materials have been identified in the study area. The locations of these sites are shown in Exhibit 4-25.



Key to hazardous materials sites: **1.** Service station and store **2.** Former service station **3.** Spill location **4.** NE 219th Street multi-use site **5.** Service station **6.** Auto wrecking and tow/auto sales **7. NE** 72nd Avenue drum site **8.** Truck salvage **9.** Pipeline Corporation **10.** WSDOT Battle Ground state highway property

Exhibit 4-25: Hazardous materials site locations

KEY POINT

HOW WERE POTENTIAL HAZARDOUS MATERIALS LOCATIONS IDENTIFIED?

Known or potentially contaminated sites located within 1,000 feet of the study area were identified by reviewing state and federal regulatory databases, historical records, Washington State Department of Ecology and state archive files, and through a field reconnaissance of the study area. More detailed information on this process is presented in Appendix L, *Hazardous Materials ISA-Level Discipline Report.*

The most common source of suspected contamination at these locations is from petroleum products with nine of the 10 sites potentially affected. The other sources of potential contamination include solvents and metals with three potentially affected sites and natural gas at one site. The highest concentration of hazardous materials sites is located in Dollars Corner.

The Build Alternative could disturb some of the potential hazardous materials sites. Sites 5, 6, 7, and 8 are considered high potential effect sites because they contain documented soil contamination and are planned for partial property acquisitions as part of the project. However excavation work is assumed possible at these sites without disturbing contaminants.

The other potential hazardous materials sites are not on land that would be acquired for the project, and thus, are less likely to be affected by the project. Sites 1, 2, and 3 are considered medium potential effect sites.

These sites have documented soil and groundwater contamination and are located within 1,000 feet of the study area. Sites 4, 9, and 10 are considered low potential effect sites. These sites have been identified as potential contamination sources; however, there are no documented releases from these sites. All 10 sites are considered "reasonably predictable" where sites are small to medium in size, the potential contaminants are not extremely toxic or difficult to treat, and remediation approaches are straightforward.

Hazardous Materials Site 5:
Current service station

Potential hazardous materials sites would not be disturbed under the No Build Alternative, as SR 502 would remain unchanged from its present condition.

Under the Build Alternative, the long-term effects related to hazardous materials from the operation of the project would primarily be from contaminants carried in stormwater runoff. Contaminants found in stormwater runoff include fuel, petroleum, lubricants, heavy metal compounds from tires and brake pad dust, and automobile engine coolants leaking from passing vehicles. However, the Build Alternative would construct stormwater and water quality treatment facilities designed to collect and retain pollutants from traffic along the project corridor, thereby avoiding long-term adverse effects related to hazardous materials from the operation of the project.

Hazardous Materials Site 6:
Auto wrecking and tow/auto sales

In comparison to the No Build Alternative, the Build Alternative would improve traffic operations along the entire project corridor. This would help reduce the risk of accidents, including those involving the release of hazardous materials, and would thereby decrease the amount of harmful materials that might enter the soil and water in the study area.

Hazardous Materials Site 7:
72nd Avenue drum site

Prior to Washington State Department of Transportation's acquisition of properties for right of way, current property owners could be responsible for the legal removal and disposal of any existing hazardous materials. The removal and proper disposal of hazardous materials prior to and during construction of the project would have long-term beneficial effects to the study area. Removing these materials would eliminate future potential public health hazards and liability risks which could occur from these materials remaining in the area. The No Build Alternative would not have the beneficial effect of removing hazardous materials that may exist in the study area.

Hazardous Materials Site 8:
Truck salvage

How would the project affect public utilities?

See Appendix Q, *Social/Environmental Justice/Economics Discipline Report* for more details on public utilities in the study area, effects of the alternatives, and mitigation.

Though the project is semi-rural, most residents and businesses have access to public utilities (Exhibit 4-26). Clark Public Utilities provides water service to most unincorporated areas of the county. However, within the study area a number of properties rely on on-site wells for their drinking water. Although the study area is within the Hazel Dell Sewer District's service area, there are no existing sewer lines. Individual property owners have private on-site septic systems. Clark County regulates and manages stormwater runoff in the study area; currently there is no engineered treatment of stormwater runoff from SR 502.

Major electric and natural gas transmission lines also cross the project corridor. A Bonneville Power Administration power line crosses the corridor near NE 41st Court. A Williams Company transmission gas pipeline crosses immediately west of the intersection at NE 50th Avenue and a second corridor crossing occurs immediately east of NE 87th Avenue.

The No Build Alternative would have no long-term effects on utilities.

Exhibit 4-26: Utility providers

Service	Provider
Electricity	Clark Public Utilities
Natural Gas	Northwest Natural Gas
Water Supply System	Clark Public Utilities and private drinking water wells
Sanitary Sewer Services	Hazel Dell Sewer District and private septic systems
Sewage Treatment Facilities	Clark County
Solid Waste	Private Hauler

Source: Clark County Community Development, 2004.

KEY POINT

Washington State Department of Transportation may need to acquire parcels where it would not be possible to modify or reconfigure the septic systems so that the current land use could continue.

With the Build Alternative, there would be a number of changes to utilities. During the construction period, some public utilities would be newly constructed, relocated or modified. To improve safety, above-ground facilities would be relocated further from the edge of the travel lane. For the most part, the new construction would be completed prior to switching customers from the old utility system to the new system. A number of private drinking wells or septic systems would need to be modified or relocated. For a few properties, it may not be possible to modify or reconfigure the septic systems. In these cases, Washington State Department of Transportation may need to purchase the entire parcel and displace current uses if they cannot continue without a septic system. This determination would be made during the project's right of way acquisition phase.

The Build Alternative would provide stormwater detention and treatment facilities. This would have the beneficial effect of reducing localized flooding after storm events and reducing pollutants entering the groundwater and streams. Clark Public Utilities would install a new water line within the public right of way. This water line could potentially be accessed by adjacent property owners and would provide water to future uses along the roadway.

The Build Alternative would have no effect on the major electric or gas transmission lines that currently cross or run parallel to SR 502. A property owned by the Bonneville Power Administration would potentially be affected by right of way acquisitions. Washington State Department of Transportation would purchase an easement from the Bonneville Power Administration but the current use could continue on the remainder of the parcel.

At the Sunset Oaks and the Mill Creek North mitigation sites, no long-term effects to utilities are expected.

How would the project affect air quality?

See Appendix H, *Air Quality Discipline Report* for more details on air quality in the study area, effects of the alternatives, and mitigation.

Automobiles and other vehicle traffic are major contributors to air pollution. The amount of pollution generated depends on the number of vehicles in use, amount of travel, type and quality of fuel, and travel speeds.

Under the Clean Air Act, the US Environmental Protection Agency has established the National Ambient Air Quality Standards, which specify maximum concentrations for criteria pollutants. The study area is in attainment for all criteria pollutants and therefore is considered to have air quality as good as or better than specified by the National Ambient Air Quality Standards. As such, demonstration of compliance with the US Environmental Protection Agency's Final Conformity Rule is not required.

In addition to the criteria pollutants for which there are National Ambient Air Quality Standards, the US Environmental Protection Agency also regulates air toxics. Mobile source air toxics are a subset of the 188 air toxics defined by the Clean Air Act. Mobile source air toxics are compounds emitted from highway vehicles and non-road equipment. Some toxic compounds are present in fuel and are emitted to the air when the fuel evaporates or passes through the engine unburned. Other toxics are emitted from the incomplete combustion of fuels or as secondary combustion products. Metal air toxics also result from engine wear or from impurities in oil or gasoline. In

DEFINITION

WHICH POLLUTANTS ARE REGULATED BY THE NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)?

Pollutants regulated by the NAAQS are known as "criteria pollutants." These are:

- Carbon monoxide (CO)
- Lead (Pb)
- Nitrogen dioxide (NO_2)
- Ozone (O_3)
- Particulate matter less than 10 micrometers in size (PM_{10})
- Particulate matter less than 2.5 micrometers in size ($PM_{2.5}$)
- Sulfur dioxide (SO_2)

DEFINITION

WHAT IS AN AREA THAT IS IN ATTAINMENT?

An area that is in attainment is considered to have air quality as good as or better than the National Ambient Air Quality Standards for the criteria pollutants designated in the Clean Air Act.

addition, the US Environmental Protection Agency identified seven compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (http://www.epa.gov/ttn/atw/nata1999/). These are: benzene, acrolein, formaldehyde, 1,3-butadiene, diesel exhaust, naphthalene, and polycyclic organic matter. However, the US Environmental Protection Agency has not yet established ambient air quality standards for mobile source air toxics levels. The Federal Highway Administration's "Interim Guidance Update on Air Toxic Analysis in National Environmental Policy Act Documents" (September 30, 2009) provides guidance on when and how to analyze mobile source air toxics in the National Environmental Policy Act process for highways.

As described in Chapter 3, *Comparison of the Alternatives – Safety and Mobility*, traffic volumes and congestion would increase over time under the No Build Alternative on SR 502 as a result of continuing population growth in and around Battle Ground. Even though some additional traffic is expected to use SR 502 under the Build Alternative, the roadway improvements provided would substantially reduce congestion relative to the No Build Alternative.

Modeling of carbon monoxide levels was conducted for intersections within and near the study area. This modeling shows that both the No Build and Build Alternatives would not cause a violation of the applicable National Ambient Air Quality Standards, and future carbon monoxide levels along the corridor are expected to be similar to today's levels.

Because the study area is in attainment with the National Ambient Air Quality Standards, a detailed analysis of particulate matter or ozone emissions is not required. The Build Alternative is not expected to have significant effects on levels of particulate matter or ozone since it would not result in substantial changes in the overall number of trips being made.

The SR 502 corridor is approximately five miles in length. Land uses along the corridor are rural – primarily agriculture and rural residential. There are no schools or parks along the corridor, although there are several churches. The widening of the roadway would have the effect of moving some traffic closer to these land uses. Therefore, there may be localized areas where ambient concentrations of mobile source air toxics could be higher at some locations than under the No Build Alternative, but this could be offset by increases in speeds and reductions in congestion (which are associated with lower mobile source air toxics emissions). In addition, mobile source air toxics emissions would be lower in other locations when traffic shifts away from them.

The estimated vehicle miles traveled would be higher for the Build Alternative than the No Build Alternative because the additional capacity and efficiency of the improved roadway would attract rerouted trips from elsewhere in the transportation network. The increase in emissions along SR 502 would be partially offset by changes to emission rates due to increased speeds under the Build Alternative; the US Environmental Protection Agency's MOBILE6 emissions model shows that emissions of all of the priority mobile source air toxics, except for diesel particulate matter, decrease as speed increases. In addition, the US Environmental Protection Agency's vehicle and fuel regulations, coupled with fleet turnover, will over time cause substantial mobile source air toxics reductions that, in almost all cases, will cause region-wide mobile source air toxics levels to be lower than today.

What are the energy needs of the project?

See Appendix K, *Energy Discipline Report* for more details on the energy needs of the project, effects of the alternatives, and mitigation.

The use of SR 502 results in energy consumption in the form of fuel burned by vehicles using the roadway, as well as a negligible amount of energy for signals, lighting, and maintenance. The amount of fuel consumed depends primarily on how many (and how far) vehicles travel on the roadway and the speed of travel, including the amount of delay due to congestion or stopping and idling.

KEY POINT

WHAT IS DELAY?

Delay results from slowed or stopped traffic, and is measured as the additional time spent traveling compared to normal travel times under light or free-flow travel conditions.

Fuel consumption was estimated for vehicles using SR 502 during both the morning and evening peak hours, which are the periods of the day that correspond to commuting hours. Because both the number of vehicles using the roadway and congestion levels are highest at these times, fuel consumption is at its peak as well.

Exhibit 4-27 compares fuel consumption on the project corridor today to projected conditions in the future under the No Build Alternative and the Build Alternative. Fuel consumption for vehicles using SR 502 is expected to approximately double by 2033 under the No Build Alternative due to substantial increases in the number of vehicles using the roadway and resulting increases in congestion.

Under the Build Alternative, SR 502 would be widened to four travel lanes to relieve congestion. The increased capacity on SR 502 would attract additional trips, as evidenced by the increase in vehicle miles of travel. However, the Build Alternative would also reduce congestion and increase average speeds considerably, resulting in no significant change in energy consumption compared to the No Build Alternative.

DEFINITION

WHAT IS VEHICLE MILES OF TRAVEL?

Vehicle miles of travel is a measure that accounts for both the number of vehicles using a roadway and the distance traveled by those vehicles.

Exhibit 4-27: Summary data for SR 502 energy consumption

Measures of effectiveness			Existing	2033 No Build	2033 Build
Average speed (mph)	Eastbound	AM peak	42	15	27
		PM peak	26	9	24
	Westbound	AM peak	37	14	25
		PM peak	31	10	31
Travel distance (vehicle miles traveled)		AM peak	12,040	18,760	25,165
		PM peak	17,080	20,205	31,315
Fuel consumption (gallons)		AM peak	389	770	825
		PM peak	538	1,087	1,027

Note: Fuel consumption for the AM or PM peak under a particular alternative is calculated by averaging the eastbound and westbound peak speeds for that time (AM or PM) to determine the appropriate fuel consumption rate (FCR) as listed in the Transportation Date Energy Book by Davis and Diegel. The FCR is then multiplied by the vehicle miles traveled to calculate the estimated fuel that would be consumed under the alternative.

Indirect energy consumption – resulting from things such as manufacturing and maintenance of vehicles that use SR 502 – is not expected to vary appreciably between the alternatives because people's decisions to purchase new vehicles or have maintenance completed on their current vehicles is unlikely to be influenced by construction of the project.